Monetary Strategy with an Elastic Price Standard

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When the Open Market Committee met in mid-1973 to make the policy decisions that would influence the economy in 1974, the situation seemed serene. The price level stood at 98.5 as measured by an index with 1952 = 100. Unemployment was 5.8 percent, close to its normal level of 6 percent. The Committee forecast that the 1974 price level would rise to 99.7 percent, a development the Committee welcomed because they had a strategy of holding prices at 100. The forecast for unemployment was 6 percent.

Late in 1973 and for the first half of 1974, OPEC hit the economy with an unexpected price shock of unprecedented magnitude. The price level rose to 102.4 and unemployment reached 6.6 percent. After settingpolicyfor 1975, the Committee forecast that unemployment would remain at 6.6 percent and the price level would rise to 104.8. This forecast put the economy on track as far as the Committee's strategy was concerned, for that strategy permitted the price level to rise above the target of 100 by 8 points for each point by which the unemploymentmte exceeded 6 percent. In their view, this stmtegy permitted the economy to roll with the punch when a shock struck.

More bad news hit in 1975. Unemployment turned out to be far worse than the Committee or any other forecaster thought: It averaged 8.4 percent. But the price level rose to only 104.2. Strong stimulus was put in place in 1975 so that forecast unemployment for 1976 was down to 6.5 percent. The price forecast for 1976 was 104.0, so that once again the elastic target was satisfied.

The Committee debated vigorously about the degree of stimulus necessary to bring unemployment down by this much in a single year: As it happened, they chose slightly too much stimulus. Unemployment was actually 6.0 percent in 1976 and the price level was 104.0.

The economy proceeded smoothly through 1977 and 1978. Unemployment in 1978 was 6.4 percent, and the price level was down to 103.2. The Committee's forecast was for continuing gentle deflation until the price level returned to its original level of 100.

In 1979 and 1980, OPEC struck again, before the lingering effects of the first shock were completely worked out. Again, policy let the economy roll with the punch. The situation was much more favorable this time because the price shock was not accompanied by an adverse demand shock; in fact, there was a favorable surprise about unemployment in 1981. Unemployment reached 6.7 percent in 1980 but was back down to 6.2 percent in 1981. Again, the price level absorbed most of the shock in the short run. It reached 109.7 in 1981. In 1982 and 1983, the Committee slowed the economy a bit with contmctionary policy that mised unemployment to 7.2 and 7.4 percent. The price level fell gradually and reached 107.8 in 1983.

As of mid-1984, the Committee plans to continue slightly slack conditions in order to bring the price level back to the long-run target of 100 in 1952 prices. At no time in the 30-year history of the elastic price standards has the price level gone above 110. Only once has the unemployment rate exceeded 7.5 percent.

Unhappily, a report on the history of postwar monetary policy doesn't read like this at all. Instead, the price level in 1983 was 372 on the basis of 1952 = 100. And unemployment did not do nearly as well either—it actually exceeded 7.5 percent in five different years. The reason for the poor performance of monetary policy was the lack of a strategy. My main point in this paper is that almost any monetary strategy would have given performance similar to this fictional account. I give a menu of policies, out of which the anti-inflation hawk can choose one and the anti-unemployment dove can choose another. What is most interesting is that the hawkish policy would have given a better record for *unemployment* and the dovish policy a better record for *price stability* than we got from actual policy.

It is not enough to formulate the strategy of monetary policy as bringing about price stability. Few economists endorse the unlimited manipulations

of monetary instruments as necessary to ensure complete price stability, without regard for the state of economic activity. Rather, the strategies promoted by economists implicitly or explicitly accept some fluctuations in the price level so as to cushion real activity. Price stability in the longer run is hoped to be the outcome of these strategies.

Professional opinion has settled on two compromise strategies. The first is constant monetary growth. When the portfolio of the Federal Reserve grows at a predetermined rate and does not react to events in the economy, shocks to supply and demand can raise and lower prices in a cushioning way in the short run, but in the long run the price level is supposed to remain close to constant. Unhappily, the promise of price stability will go unfulfilled if there are long-term shifts in the demand for the Fed's liabilities. Moreover, if these shifts occur quickly, as they did in the early 1980s, they can be destabilizing to real activity as well.

The second strategy, constant growth of nominal GNP, has enjoyed growing popularity among macroeconomists as the defects of constant money growth have become apparent. Again, prices are allowed to fluctuate in the short run under a nominal GNP rule, but will tend toward a stable level in the longer run. Except possibly for transient errors in executing constant nominal GNP growth, the shifts in monetary velocity that are so troublesome for a money growth rule are benign under the nominal GNP rule. The only threat to longer-run price stability under the nominal GNP rule is an unexpected shift in the growth of full-employment GNP, which will bring a change in inflation in the long run of opposite sign and the same magnitude.

My point here is to advance the discussion beyond a comparison of the two major existing proposals. I will formulate a monetary strategy where the two goals of long-run price stability and short-run employment stability are stated more clearly than they are in the constant money growth rule or in the nominal GNP growth rule. Specifically, I will examine an elastic price target. Under this strategy, the Fed is instructed to stabilize the price level at a particular value. However, the strategy is elastic in the short run because the Fed is given some leeway in achieving the target depending on the amount of unemployment. When a price shock hits, the Fed does not have to clamp down on the economy right away to get the price level back to the target. Instead, when unemployment rises, the allowable price level rises as well. When the economy begins to recover and unemployment falls toward its normal level, the Fed has to take action to get the price level back down to the target. Because the economy always tends toward an equilibrium with normal unemployment, the Fed ultimately has to

achieve the price target. But the linkage to unemployment cushions the economy in the desirable way in the short run.

The formal statement of the elastic price strategy is clean and straightforward: Monetary policy is on track when the deviation of the price level from its constant target level is eight times the deviation of unemployment from its normal level. Policy is too tight if the price deviation is less than eight times the unemployment deviation; it is too expansionary when the price deviation is more than eight times the unemployment deviation. The elasticity of 8 in this statement is a matter for policymakers to choose; hawks may want an elasticity as low as 2 and doves may go as high as 10. Later in the paper I will provide some data that will show the alternative consequences of the choice of elasticity.

When the elasticity is chosen to be about 2.5 or 3.0, the elastic price strategy gives results that are quite similar to monetary targeting or nominal GNP targeting. Thus both policy strategies are somewhat elastic. However, optimal policy may well involve a higher elasticity. According to estimates that appear later in this paper, the standard deviation of unemployment would have been about 1.1 percentage points under an elastic price strategy with an elasticity of 3, and only 0.8 percentage points with an elasticity of 8. Of course, the improved stability of unemployment under a higher elasticity would come at the cost of worsened performance for price stability—with an elasticity of 3, the price level would have had a standard deviation of 2.7 percent around the target, as against 3.4 percent with the elasticity of 8.

The elastic price standard is not an arbitrary choice as a strategy for monetary policy. Under rather general and plausible conditions, it is very close to optimal to aim policy to achieve the elastic price standard. The choice of elasticity depends on the relative social costs of inflation and unemployment, but otherwise the form of the optimal monetary policy is almost exactly that given by the elastic standard.

The need for a monetary strategy

So many other authors have argued so persuasively, in my view, on the importance of precommitment to an anti-inflationary monetary strategy that I do not want to dwell on the point here. Bennett McCallum's paper for this symposium has added to the case that the adoption, once and for all, of a credible policy for stabilizing prices will itself make the job of price stabilization less costly. Further, I respect the case made by Kydland and Prescott (1977) and Barro and Gordon (1981) that reconsideration of

the goals of monetary policy each year invites that problem of policy inconsistency: Without precommitment, the payoff each year from creating a new inflationary surprise leads to a policy that is more inflationary than the optimal policy. To get to the optimum, policy choices must be made once and for all and embedded in a formula.

For many years, the case for a monetary policy strategy as a fixed rule was argued exclusively by monetarists. Precommitment to a rule was virtually synonymous with adoption of the monetarist recommendation of predetermined money growth. But the logic of precommitment applies to monetary strategies in general, not just the particular strategy of fixed growth of some measure of the money stock.

What we are looking for in a monetary strategy

The basic long-run goal of monetary policy is to provide stable prices. But shifts in monetary policy influence real economic activity in the short run. Consequently a monetary strategy has to balance the two objectives of price stability and smooth real growth. The two specific quantitative dimensions of economic performance that I will examine are variability in the price level and in the unemployment **rate.** In both cases, I will depart somewhat from conventional analyses, so some justification for looking at these two measures is in order.

Price variability

I will be concerned with the price level, not its rate of change. The goal of monetary policy, in my view, is not to keep the rate of inflation around zero; it is a little more ambitious—to keep the price level on target. Every time the price level shifts thanks to some random shock, the difference in objectives becomes important. Under inflation stabilization, policy does not try to bring about negative inflation after a burst of positive inflation. Instead, it attempts to prevent further inflation. The burst of inflation leaves its mark permanently in the form of a higher price level. Under price stabilization, policy pushes the price level back down to its target. Over long periods, the price level can drift up or down under inflation stabilization, whereas it cannot drift under successful price 'stabilization. Both types of policy will keep the average rate of inflation at zero.

My advocacy of price stabilization derives from my beliefs about why price instability is costly to the economy. The purchasing power of the dollar is a basic unit of measurement to the public. Many important economic decisions, especially those made by the general public, are stated in terms

of the dollar. A drifting price level interferes with good economic planning, especially personal planning. Let me give two examples:

- Private pensions almost always pay out a fixed dollar amount. When the price level drifts upward, the purchasing power of the pension is front-loaded. Retired people have trouble making side arrangements to equalize purchasing power over the years of retirement. Because the public doesn't fully understand price level drift, pension arrangements designed to offset it are rarely offered, and are unpopular when they are offered. A pension with stable purchasing power will necessarily pay less in the first year than a fixed dollar pension, if the price level is drifting upward.
- Mortgages involve payment streams that are roughly constant in dollars over their terms. The burden of the payments is far greater in earlier years if the price level is drifting upward. Even though mortgage payments are now frequently indexed to interest rates, no progress has been made at all in equalizing the real burden of payments over time.

Although a policy of inflation stabilization would solve some of these problems, price level stabilization would be even better. It is well within the power of monetary policy to promise a 30-year-old worker today that the purchasing power of the dollar at the time of his retirement 35 years later will be within 10 percent of what it is today. No such statement can be made under inflation stabilization.

Unemployment variability

Unemployment is socially undesirable, at least within the range likely to be experienced under a monetary strategy of price stabilization. On the margin, every reduction of unemployment appears to be good. Shouldn't the goal of a monetary strategy be the minimization of unemployment, not the reduction in the variability of unemployment?

The answer is that monetary policy is powerless to influence the average level of unemployment in the long run. As Milton Friedman (1968) argued persuasively almost 20 years ago, no amount of monetary expansion can bring a permanent economic high. A simple comparison of unemployment and inflation among the world's economies makes the point starkly. Countries with rapid money growth and high inflation have, if anything, higher unemployment than those with stable prices.

Given that monetary policy is forced to accept about 6 percent unemployment, on the average, and given the reasonable proposition that the

marginal social costs of unemployment above that level exceed the marginal gains below that level, the objective of policy should be low variability of unemployment. Assigning this limited objective to monetary policy does not in any way require the belief that 6 percent unemployment is socially optimal. Policies that bring permanent reduction of unemployment through improved labor market performance have a substantial social payoff. It is just that monetary policy is not one of those policies.

The policy frontier

Monetary strategies oriented toward limiting the variability of prices and unemployment can be classified along an axis of hawkishness and dovishness. **A** hawkish policy moves aggressively to offset every price disturbance, tolerating wide swings in unemployment as needed for price stability. It achieves a lower level of price variability at the cost of a high level of unemployment variability. A dovish policy keeps unemployment close to *6* percent and lets the price level swing more widely to absorb economic shocks. Its price variability is higher but its unemployment variability is lower. The idea that policy can be analyzed in terms of variability of unemployment and the price level has been developed by John Taylor in an important series of papers (1980, 1981, 1982).

I should be clear that not every policy is either hawkish or dovish. Some policies are just bad. It is perfectly possible for a policy to make unemployment fluctuate as much as it does in a hawkish policy and yet for prices to depart from target as much as they do in a dovish policy. In fact, actual policy had exactly that character over the postwar period, as I will show later in this paper.

I will define the ***policy frontier*** as the set of policies that give the lowest combinations of unemployment and price variability. A policy on the frontier has the property that no other policy can deliver both lower unemployment variability and lower price variability. **A** more hawkish policy can reduce price variability, but only by raising unemployment variability.

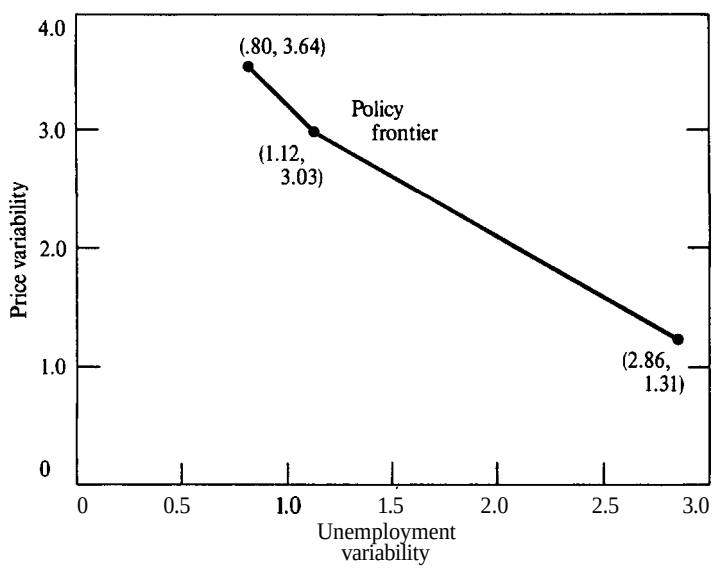
Figure 1 shows the policy frontier for the U.S. economy derived later in the paper. The horizontal axis is unemployment variability, measured as the standard deviation of the departure of unemployment from 6 percent. The vertical axis is price variability, measured as the standard deviation of the percent departure of the price level from a constant target. The policy frontier curves up and to the left, with dovish policies at the upper end and hawkish ones at the lower end. The curve of the frontier means that the more dovish policies have to incur more and more price variability per unit of reduced unemployment variability.

The choice of a point on the frontier is a matter of politics and social preferences, about which economists have little to say except as citizens. My principal message is to point out the existence of the frontier and to stress that it takes a coherent monetary strategy to get to the frontier. The policy of the past decades put us far above the frontier, with substantially more unemployment variability and almost infinitely more price variability than a point in the middle of the frontier in Figure 1.

Elastic price targeting and the policy frontier

Monetary strategies based on elastic price targets have a close relation to the policy frontier:

FIGURE 1
The Policy Frontier



Note: The policy frontier shows the most favorable combinations of unemployment and price variability. The horizontal axis is the standard deviation of the unemployment rate, in percent, and the vertical axis is the standard deviation of the percent departure of the price level from target. Three points on the frontier are derived by simulation in the next section.

Economic structure and the execution of policy

Two important relationships govern the policy frontier. The first is the aggregate demand schedule that controls the influence of monetary policy

on real activity. There is about a one-year lag before monetary expansion lowers unemployment reliably. I will also assume that policymakers know roughly how much money growth is needed to lower unemployment by one percentage point over the year starting a year after the growth occurs. Another important aspect of aggregate demand is the predictability of unemployment a year forward. Errors in forecasting will generate errors in achieving the elastic target, which have implications for the amount of unemployment and price variability.

The second important relationship is the price adjustment process, or Phillips curve. More economic slack, as indicated by higher unemployment, depresses inflation. The slope of the Phillips curve is a critical parameter for the policy frontier—the lower the slope, the farther the frontier is from the origin. Unresponsive inflation means that more unemployment must be incurred to get prices back on target after a shock. I take the slope of the Phillips curve to be about one half percentage point of reduced inflation, in the course of a year, for a one percentage point increase in unemployment, maintained for a year. This slope is in line with recent empirical estimates for the U.S.

The Phillips curve is perturbed from time to time by inflationary shocks. Occasionally, wages rise more than labor market conditions would normally warrant, and prices rise by more than indicated by the Phillips curve. More important, however, is the increase in inflation associated with jumps in oil prices and in other determinants of the overall price level. These shocks are critical for the design of monetary strategy. More than anything else, the strategy must be formulated to deal intelligently with the burst of inflation and higher unemployment set off by each shock. Although the two oil shocks of the 1970s are the most conspicuous inflationary disturbances of the postwar period, other shocks, positive and negative, occurred as well, and there is every reason to think that new shocks will continue to complicate monetary policy in the future.

Subject to these two important relationships, monetary policy operates according to the strategy of the elastic price target. Specifically, the goal of policy is to influence prices and unemployment so that the price level, p, is as close as possible to the elastic target. The percentage departure of the price level, p, from its ultimate target, p*, is an elasticity A times the departure of unemployment from its nominal level of 6 percent:

$$100\,(p - p^*)/p^* = A \cdot (u - 6)$$

The Fed's operating procedures under the elastic price target

It is neither practical nor desirable to dictate to the Fed exactly how it should proceed under the elastic targeting strategy. Rather, Congress's

instructions to the Fed should emphasize the result: close achievement of the elastic target. As financial markets evolve and the Fed learns how best to operate to achieve the target, procedures will change and performance will improve.

I think the Fed's internal procedure would proceed in the following way: Each month, it should formulate a quarterly forecast for the forthcoming two years. The forecasts should combine the results of formal models with the judgments of experienced forecasters. Reliable outside forecasts should receive some weight as well.

With the forecast in hand, the Fed should examine the one-year period starting two quarters in the future. For example, in August the next calendar year should constitute the criterion period; in April, it should be the twelve months starting in October, and so on. The forecasts for the price level and unemployment in the criterion period should be compared to the elastic target. If the forecast price level exceeds the target as adjusted by the forecast unemployment rate, then policy should be tightened. If the outlook is for a price level below target, policy should be turned expansive. After policy is changed, new forecasts should be prepared and the elastic price target checked again for the criterion period. The forecasting-policy resetting exercise should be continued until the elastic target is satisfied exactly in the forecast for the criterion period.

Although the elastic target is stated in terms of the price level, it is likely that the changes that occur as policy is shifted are more in forecast unemployment than in the forecast price level. For example, with an elasticity of 5, if the forecast price level is 338, 2.4 percent above the target of 330, and the fore°cast unemployment rate is 6.2 percent, the price level is 1.4 percent above where it should be according to the elastic target (five times the unemployment gap is 1.0 percent, as against an actual price gap of 2.4 percent). Projected policy might then be changed by lowering reserves by 0.6 percent, which would translate into an increase in forecast unemployment of 0.26 percentage points and a decrease in the forecast price level of 0.1 percent. The new forecast is right on target—the price level is now forecast at 2.3 percent over the ultimate target while unemployment is 0.46 percentage points over 6 percent, and 2.3 is five times 0.46.

How policy influences the price level and unemployment

The policy moves needed to keep on target should be made fairly quickly. It takes about a year for monetary policy to have its strongest impact on unemployment and even longer for the price level. Over the one-year span, both variables in the elastic target are controllable by monetary

policy, so it is reasonable to ask policy to achieve the target in terms of a forecast a year ahead. Economists disagree over the relative influence of monetary policy on the two variables, but agree strongly that one or the other is strongly controllable a year hence. One of the great virtues of the elastic price target as a monetary strategy is that its effectiveness is agreed upon by all major schools of thought.

With respect to the price level, monetary policy acts quickly and effectively on certain types of prices, but slowly on others. Auction prices of raw materials decline immediately when monetary contraction brings higher interest rates. More importantly, monetary contraction causes the dollar to appreciate against other currencies, which immediately lowers the dollar prices of many goods traded in world markets. Monetary control of prices of tradeables holds both for imports and for some types of exports. With a longer lag, monetary policy influences wages and therefore prices throughout the economy.

Monetary influence over the unemployment rate is an important feature of Keynesian economics and is agreed upon by the great majority of practical macroeconomists. The influence builds to a peak about a year after a policy move and then subsides to zero. Monetary policy cannot influence the average level of unemployment in the long run. But in the short run, a monetary contraction raises interest rates and depresses investment demand for housing, plant and equipment, and consumer durables. Employment in construction and durables declines and unemployment rises throughout the labor market. In addition, higher interest rates cause dollar appreciation; higher U.S. prices to the rest of the world and lower import prices to the U.S. divert demand away from U.S. producers and so raise unemployment through another channel.

As a general matter, monetary policy is entirely capable of pushing the economy in the direction necessary to achieve the elastic price target. Moreover, this conclusion holds if Keynesian economists are right that wages and prices are sticky and it holds equally if prices are fluid and move quickly to clear markets. The conclusion is also strongly supported by the forecasting models in use in the Fed today.

Choice of the monetary policy instrument

I have avoided taking a position on exactly how the Fed should carry out each month's monetary policy; this is a question of tactics more than strategy. Any reasonable choice of policy instrument is compatible with the strategy of adjusting the instrument as necessary to make the forecast

price and unemployment levels satisfy the elastic target in the forecast. In current monetary institutions, the choices are

- A short-term interest rate
- Reserves
- The monetary base

All of these are directly under the Fed's control, in that simple operating instructions for the open market desk can achieve the agreed upon level of the instrument without any error. A broader monetary aggregate like M1 cannot serve as a policy instrument for it is not directly under the Fed's control.

The advantage of using the interest rate as an instrument is well known: Unexpected shifts in the demands for reserves and currency are automatically offset and have no disturbing effect on the rest of the economy. During the financial transition of the early 1980s, there was much to be said for an interest-rate instrument. Moreover, the interest-rate instrument overcomes the troublesome problem of seasonal variations in reserve and currency demand. But the use of the interest rate increases the sensitivity of the economy to disturbances in spending. Because the interest rate would not rise automatically when consumption, investment, or other types of spending rose, the stabilizing effect of interest-rate fluctuations would be lost. A greater burden would fall on the forecasting and policy adjustment process at the Fed to respond to spending shifts.

Choosing reserves as the instrument would reverse the situation. Disturbances in spending would be cushioned by interest rates, but shifts in demand for reserves caused by movements of depositors among accounts with difference reserve requirements would be propagated into the overall economy. Then the forecasting and policy adjustment process would have to pay close attention to these shifts. The prospect for future destabilizing shifts is substantial, as only a thin line separates accounts with 12 percent reserve requirements from those with 3 percent or zero.

The monetary base is probably the least desirable instrument. The demand for currency is probably even more erratic than is the demand for reserves.

How close should we expect the Fed to come to meeting the elastic price target?

Under the operating procedure I have proposed, the Fed would concentrate on meeting the elastic price target prospectively over the forthcoming

year starting in about two quarters. The current quarter and the next quarter would be water under the bridge so far as monetary policy was concerned. Naturally, surprises would occur that would make the Fed's forecast incorrect and cause it to miss its target. Because the Fed could label any policy failure as a forecasting error created by a surprise occurring too late to be offset by policy, Congress and the public need some sense of the likely magnitude of reasonable departures from the target.

Because of the forecasting step in the policy strategy, it is simple to state as a general matter how large the mistake should be in achieving the elastic target: The departure from the elastic target should be no larger than the errors in forecasts in the price level and unemployment made one year in advance. Specifically, the number of percentage points by which the price level departs from the elastic target should be equal to the percent error in the year-ahead price level forecast plus the elasticity, **A,** times the percentage-point error in the unemployment forecast.

If the Fed is consistently missing the elastic price target by more than the forecasting errors of good outside forecasters, then policy is not working properly. Or, to put it another way, if the Fed's forecast, which always says that the elastic target will be achieved in the forthcoming year, is consistently different from outside forecasts, and the outside forecasts are more often right, then the Fed is not carrying out its job appropriately.

Congressional review of monetary policy ought to proceed as follows. Every six months, the Fed should present its forecast for the year starting two quarters later. At the same hearing, outside forecasters should testify about the outlook for the same period. If the outsiders systematically agree that the Fed will probably miss the elastic target, then the Fed would be called back to explain the discrepancy. Because the Fed is better informed about monetary policy (a key determinant of the outlook), it is possible that its forecasts will be consistently superior to other forecasts. For this reason, it should not be a requirement that the consensus forecasts always satisfy the elastic price target exactly.

The policy frontier for the postwar U.S. economy

Suppose the Fed faithfully carries out the forecasting-policy adjustment process recommended in this paper, so that an honest forecast always has the elastic price target satisfied exactly in the forthcoming year. The effect of that policy is to make the economy roll with the punch from both inflationary shocks and errors in forecasting demand. Of the two sources of disturbances, it is inflationary shocks that cause the more significant problems for monetary policy. To keep the story simple, I will describe how the

strategy of the elastic price target handles the response to an anticipated inflation shock. The story is not very different if the shock is a surprise; it only takes longer for policy to start its gradual response.

The immediate effect of an upward inflation shock is to raise both unemployment and the price level. Consider a shock that would raise the price level by 1 percent if unemployment remained constant. Because of the response of policy, the shift raises unemployment by $1/(A + 0.5)$ percentage points. The 0.5 is the slope of the Phillips curve. Because A is in the denominator, the higher is A, the lower is the jump in unemployment. For example, if $A = 3$ (roughly nominal GNP targeting) then there will be 0.29 extra percentage points of unemployment per percent of price shock, but if $A = 8$, the increase is only 0.12 extra percentage points of unemployment. In later years, the bulge in unemployment subsides at a rate of 0.51 $(A + 0.5)$ percent per year. With $A = 3$, the rate of decay is 14 percent per year; with $A = 8$, it is 6 percent per year.

Because the policy response to an inflation shock is to raise unemployment to counteract the inflation, the actual increase in the price level is less than the shock. However, reasonable policies let the price level absorb the great bulk of a shock. A 1 percent price shock raises the price level by $A/(A+0.5)$ percent. With $A = 3$, this is 86 percent; with $A = 8$, it is 94 percent. The price level rises by less than the amount of the shock because of the deflationary effect of the increase in unemployment that goes with the shock. The bulge in the price level disappears over time at the same rate as does the bulge in unemployment.

The postwar era under the elastic price target strategy

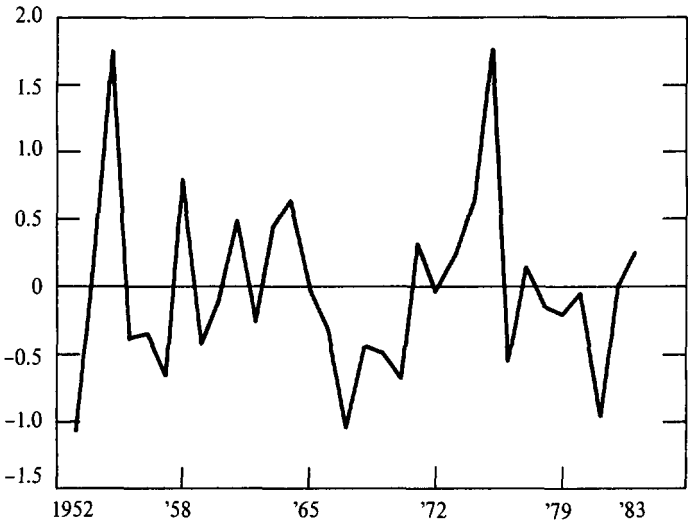
A monetary strategy based on an elastic price target would have delivered unambiguously better performance over the past 30 years than did actual policy. Unemployment variability could have been substantially less, and price variability could have been vastly less under an elastic price target for ***any*** reasonable elasticity, including nominal GNP targeting.

The first step in demonstrating this proposition is to isolate the aggregate demand forecasting errors, the price shocks, and the errors in forecasting the price shocks. For the AD forecasting errors, I ran a simple annual forecasting equation for the unemployment rate, with lagged unemployment, prices, monetary base, and interest rates as predictors. The residuals from this regression, shown in Figure 2, are representative of the forecast errors that would have been made under the process described earlier in the paper. Each recession shows up as a spike in the figure—neither this equation nor experienced forecasters are able to call the sharp increase in

unemployment that occurs in the typical recession. Notable also in Figure 2 is the prolonged period of negative forecast errors for unemployment in the mid-1960s.

FIGURE 2
Forecasting Errors for the Unemployment Rate

Percentage points of unemployment



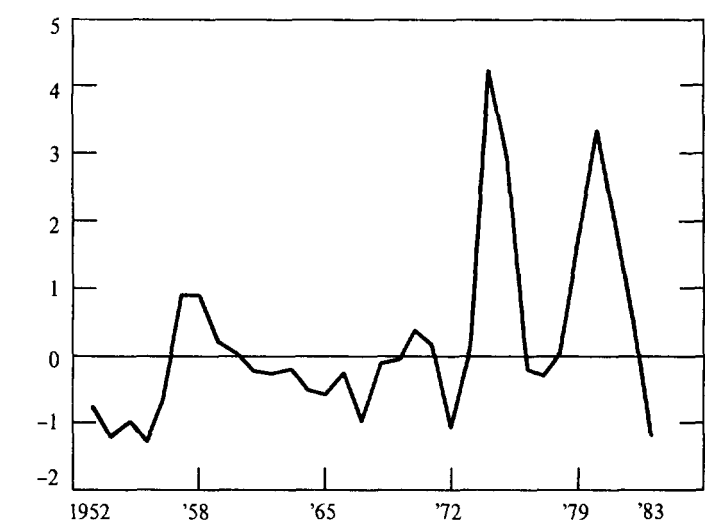
Note: Because the unemployment rate cannot be forecast perfectly accurately, even the best policy involves deviations from the elastic target. These deviations also feed into the way prices depart from the long-run target and the way that unemployment departs from its normal level of 6 percent.

Derivation of inflation shocks is a trickier issue. Most economists subscribe to the view that once inflation becomes established in the economy at a certain level, the Phillips curve shifts upward by the amount of the established inflation. Under an elastic price target, or any other sensible strategy for price stabilization, established inflation is unlikely to develop, since the public will come to have faith in monetary policy's ability to keep average inflation at zero. But to extract estimates of year-by-year inflation shocks from the actual historical data from a period of mistaken policy, some account must be taken of the growth of established inflation during the postwar period. I will estimate the shocks by subtracting the component of inflation attributable to demand and the amount of established inflation from actual inflation.

By calling almost every movement in inflation a change in established inflation, inflation shocks can be made to seem minimal. Because my purpose here is to show that elastic price targeting can handle large price shocks, I want to avoid any procedures that might understate the historical shocks. My estimates of established inflation are accordingly conservative. For the period of generally low inflation from 1948 through 1965, I took established inflation to be its average for those years, 1.5 percent per year. For the period of inflationary policy, 1966 through 1978, I took it to rise in equal increments from 1.5 percent to 6.8 percent, its value in 1978. For 1979 through 1983, I took established inflation to be at the constant level of 6.8 percent.

Figure 3 shows the estimates of inflation shocks obtained by subtracting this estimate of established inflation from actual inflation and also taking out the effects of demand by adding 0.5 (u-6). The most salient features are the two sharp spikes for the oil price shocks of 1974 and 1979-80. Other positive shocks occurred in 1957-58 and 1970-71. Negative shocks occurred in 1952-56 and 1972 (probably the effect of price controls). Figure 3 is no more than a good guess about the price shocks that would have

FIGURE 3
Inflation Shocks

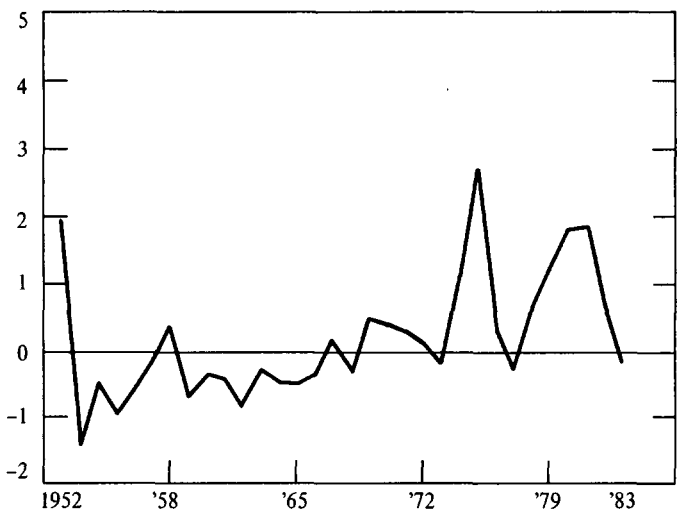


Note: The economy does not track the Phillips curve exactly. The two biggest departures occurred in 1974 and 1979-80 when oil prices rose sharply. It is the shocks themselves, not just the surprise part, that create most of the problem for stabilization policy.

occurred under a policy of price stabilization. However, the results of this paper are not sensitive to the precise series used for the price shocks.

Prediction errors for the price level also figure in the errors in achieving the elastic price target, but they are subsidiary if the elasticity is at all high, simply because errors in unemployment are multiplied by the elasticity but those for the price level are not. To get a feel for the predictability of the price shocks I regressed my series for the shocks against the same list of lagged predictors that I used for the unemployment rate. Only the lagged price level turned out to have predictive power; it explains just under half of the variance of the price shock. Figure 4 shows its predictions for the postwar period. The prediction errors for the price level are the difference between the actual price shock and the predicted price shock minus the slope of the Phillips curve times the prediction error in the unemployment rate.

FIGURE 4
Predictions of Inflation Shocks



Note: When an inflation shock is predicted, policy can start to respond to it sooner. About half of the variability of the inflation shocks in Figure 3 are predicted here. However, even perfect prediction of the shocks would not dramatically improve performance.

What would have happened under the elastic price target

My simulations of the U.S. economy under the elastic price target strategy assume that policy achieved the elastic target except for the forecast

errors just derived. Because these errors are based on crude annual equations, they are not a stringent standard of performance. Actual policy probably could have done quite a bit better. Of course, my simulations have to assume that the forecast errors occurred because of exogenous shocks to the economy, and that these shocks would have been the same under the proposed monetary strategy as they were under the actual strategy. I think this assumption is a reasonable approximation. It is wishful thinking to assert that events like the oil price shocks would not have occurred under a superior U.S. monetary policy.

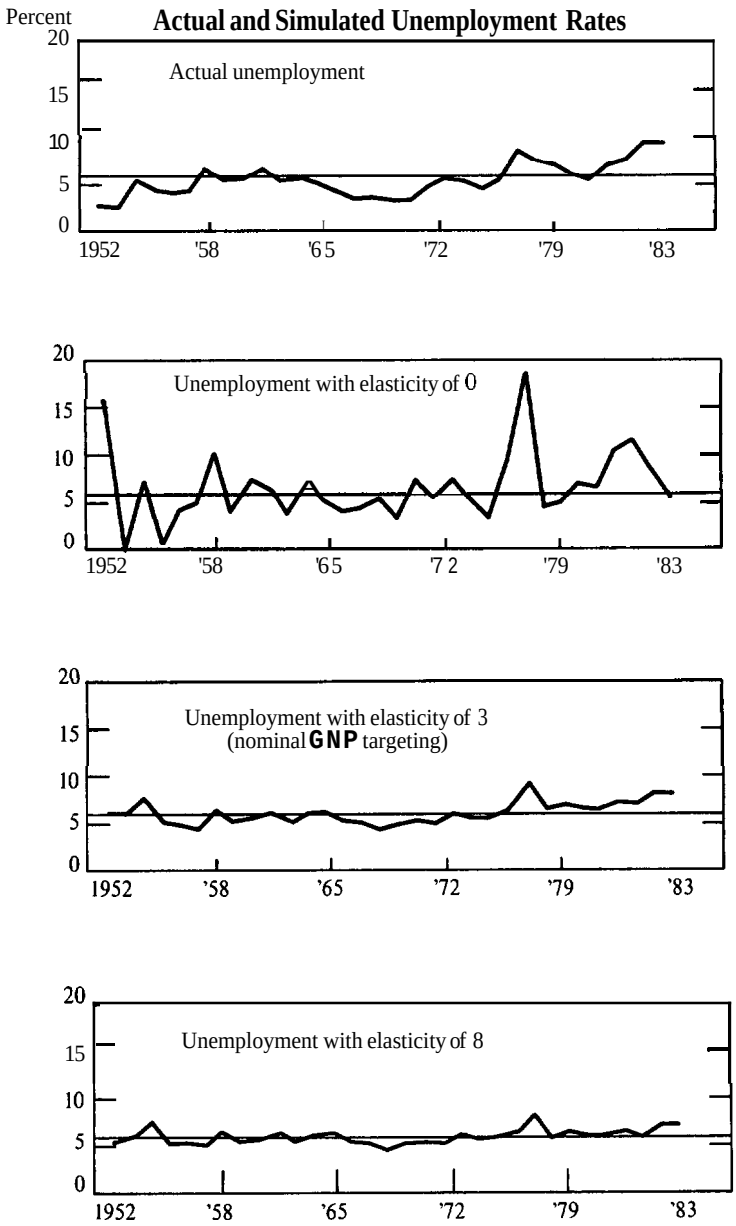
Aside from the forecast errors that brought departures from the elastic target, the only other property of the U.S. economy necessary to know for the simulations is the slope of the Phillips curve. The effect of the strategy is to keep unemployment above 6 percent (except for random forecasting errors) whenever the price level is above target and below 6 percent when it is below target. When unemployment is consistently above 6 percent, there is downward pressure on prices as the Phillips curve does its job. Gradually, the price level returns to its ultimate target. As it does so, unemployment must also approach 6 percent, through the operation of monetary policy and the elastic target.

In the simulations, the gradual return to the long-run target is not generally visible, because new shocks constantly push the economy away from the target. What is visible, however, is the tendency for the price level to stay near the target and for the unemployment rate to stay near 6 percent in spite of the battering of the economy by random shocks. Even though prices are quite sticky and policy is very gingerly about getting prices back to target by incurring excess unemployment, the price level stays much, much closer to constancy in even the most dovish of the simulations than it actually did over the postwar period. Most remarkably, the variability of unemployment is also considerably less, even though the policy is much more successful in stabilizing prices.

Figure 5 shows the simulated unemployment rates under various regimes. At the top is the actual unemployment rate. The horizontal line marks the 6 percent rate I take as the normal amount of unemployment. The plot shows the basic defect of postwar policy—unemployment was pushed too low in the 1960s so that it had to be held far above 6 percent in the 1970s and early 1980s. The combination gave much too much unemployment variability.

The second panel in Figure 5 shows how unemployment would have behaved had monetary policy been dedicated single-mindedly to price stabilization. Wild swings in policy would have brought extreme variation to

FIGURE 5
Actual and Simulated Unemployment Rates



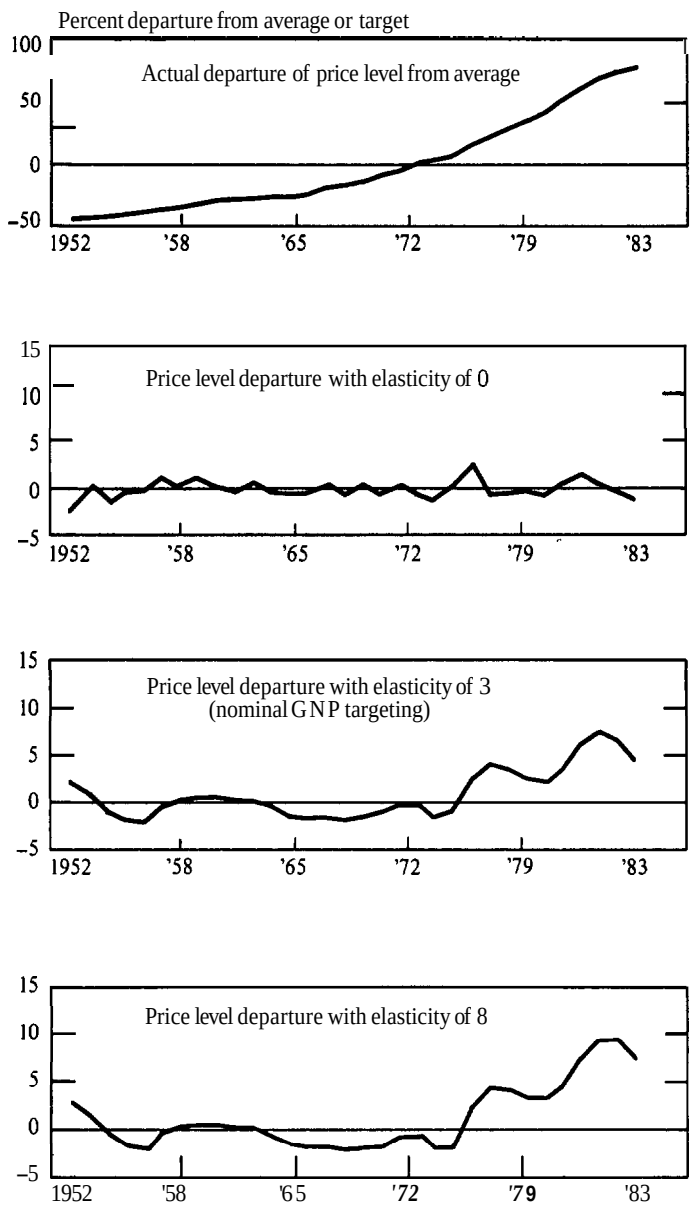
unemployment. Unemployment would have briefly reached true depression levels during the two oil price shocks. This plot shows vividly the dangers of a hawkish policy in an economy with sticky prices. Advocates of pure price stabilization must be very confident that the price adjustment process is much quicker than the one assumed in this simulation.

The two bottom panels show how the unemployment rate would have evolved under two variants of the elastic price standard. The one with an elasticity of 3 is a close approximation to nominal GNP targeting. Movements in unemployment are similar to the ones that actually occurred, but with smaller amplitude. The policy would have made the mistake of too low unemployment in the 1960s, thanks to a sequence of surprises about aggregate demand, but the mistake would have been much smaller. The burst of unemployment in 1975 would have been worse under targeting with an elasticity of 3 than it was actually (9.4 percent as against 8.5 percent). The years 1974 and 1975 saw the confluence of the largest inflation shock of the postwar period (4.2 percent in 1974) and the largest demand forecasting error (1.8 percentage points of unemployment in 1975). On the other hand, nominal GNP targeting would have given lower unemployment in 1982-83 than actually occurred. Responding to the second oil shock was less difficult because it was not accompanied by a big positive demand forecasting error. Further, sensible policy, as expressed by the elastic price strategy, would not have been struggling against the high inflation that actually occurred in 1979-82.

The unemployment record with an elasticity of 8 is quite a bit better than under nominal GNP targeting. In the worst year, 1975, unemployment would have risen only to 8.4 percent. The prolonged period of high unemployment from 1976 onward that actually occurred, and would also have occurred under nominal GNP targeting, would have been largely eliminated with the higher elasticity.

Figure 6 shows actual and simulated price levels. The top panel is the actual path of the price level from 1952 to 1983. The departures from constancy are so large that this panel has to have a different scale from the others. The next panel shows that an aggressive price stabilization policy would have kept the price level close to constant. The worst departure would have been in 1974, 2.7 percent over target. This and the other oil price shock would have been extinguished immediately through the use of monetary policy so constrictive as to return the price level back to target the very next year. Under the price stabilization policy, 1975 would have been a year of deflation, not of inflation.

FIGURE 6
Actual and Simulated Departures of Price Level from Target

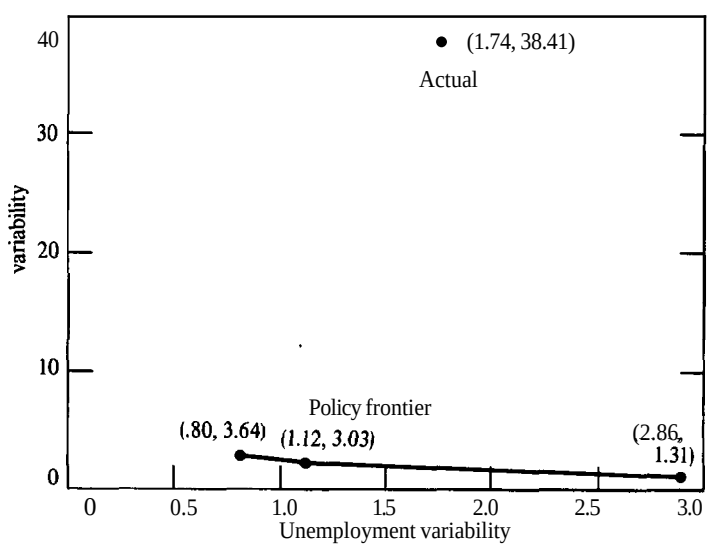


The bottom two panels of Figure 6 show the implications for the price level of the elastic price target strategy. With an elasticity of **3,** price would have remained close to the constant target level until 1974. Under the first oil shock, the price level would have risen to 3 percent over target in 1974, peaked at **4.2** percent over in 1975, and then begun a gentle decline. The process would have been interrupted by the second shock, which pushed prices to 6.2 percent over target in 1980 and to a peak of 7.6 percent over target in 1981. Then a new decline would have begun, taking the price level to only 4.7 percent over target in 1983.

The price story with an elasticity of 8 is much the same, except that the swings have greater amplitude. The price level would have peaked at 9.7 percent over target in 1981 and would have reached 7.8 percent over target in 1983.

What I want to stress most about these simulations is the superiority of either of the elastic strategies to actual policy. Figure 7 shows dramatically how completely perverse actual policy was. The policy frontier plots the standard deviations of unemployment and the price level for the three policies simulated in Figures 5 and 6. They are the same points shown in Figure 1, but here the scales are changed in order to accommodate another point, labeled actual, which shows the actual standard deviations of unem-

FIGURE 7
The Policy Frontier and Actual Economic Performance, 1952-83



Note: Actual policy brought more unemployment variability and vastly more price variability than necessary.

ployment and the price level. The actual point is far, far above the frontier. Actual policy did not make sense by any set of preferences about unemployment and price variability. In particular, the two elastic strategies *dominate* actual policy, in the sense of offering both lower unemployment variability and much lower price variability.

Conclusions

What is most important about monetary strategy is to have one. Any policy on the frontier of unemployment and price variability that is not fiercely hawkish will give better performance by far than we had under the meandering policy of the past 30 years.

Nominal GNP targeting is one policy on the frontier. With some justice, it has been criticized as overly hawkish, in that it calls for substantial unemployment in an aggressive response to an inflation shock. An elastic price target with an elasticity of 5 or 8 strikes me as closer to the optimum. But this paper has shown that differences among sensible policies are small compared to the difference between historical policy and any sensible policy.

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