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Options for Stabilization Policy

Conventional models of the macroeconomy did not anticipate the strong U.S. expansion of the past five years and cannot explain it well even today. Those models are based on the assumption that firms and workers always fully incorporate expectations of future inflation rates into their current wage and price decisions. This assumption leads to the concept of a unique natural unemployment rate for the economy, so that pushing unemployment below this natural rate will yield to ever faster inflation.

In this policy brief, we propose an alternative to the conventional natural rate model. It is based on behavioral assumptions that we believe are more realistic than those underlying the natural rate model and that are backed by research on decision-making. In our model, the effect of expected inflation itself varies with the inflation rate. This leads to a range of sustainable unemployment rates. Policymakers can achieve the lowest unemployment rate by operating the economy with a low to modest rate of inflation, in the neighborhood of the rates experienced in recent years.

Whether the U.S. economy now achieves a soft landing, and whether Europe's economies continue to expand fast enough to reduce their excessive unemployment rates, may well depend on whether policymakers reject the conventional natural rate model and adopt a view of economic possibilities that is more in line with the new model presented here.

The economy rarely sees a surprise as favorable as the United States expansion of the last half of the 1990s. That expansion has cast renewed doubt on conventional models of the economy's productive potential and on the relationship between real activity and inflation.

Since the 1970s, the conventional models used by policymakers and analysts have been based on the theory of a natural rate of unemployment which describes a unique equilibrium level of employment and output for the real economy. By the mid-1990s, prevailing estimates of this natural rate, known as the Non-Accelerating Inflation Rate of Unemployment (NAIRU), warned that unemployment had already fallen to its NAIRU and that lower unemployment would produce ever faster inflation. Yet over the next five years unemployment fell to 4 percent and core inflation remained in check.

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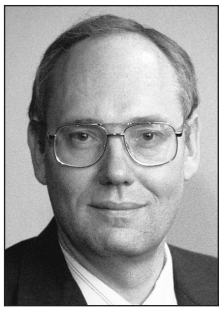

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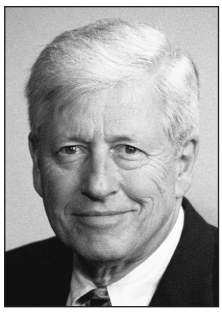

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A New Analysis of Choices

Allowing the economy to expand beyond the old NAIRU target has produced far-reaching benefits, as evidenced by comparisons with projections made in August 1996 by the Congressional Budget Office (CBO). Employment grew by 14.2 million between 1995 and mid-2000, far more than had been projected with the CBO assumption of trend growth at 6 percent unemployment. Together with faster productivity growth—some part of which probably resulted from the faster expansion of the period—this resulted in real Gross Domestic Product (GDP) rising by 12 percent more than had been projected. And rather than a $204 billion federal budget deficit for fiscal year 2000 that the CBO had projected in 1996, the Treasury reported a record $237 billion surplus for 2000, with a strong economic expansion accounting for most of the difference. Whether this historic expansion now transitions into a soft landing for the economy may depend on whether policymakers reject the prescriptions of the conventional NAIRU model and on what alternative view informs their decisions.

Even before its failure to account for U.S. performance of recent years, the model of a relatively constant NAIRU had far less empirical support than its wide acceptance would suggest. Looking back at the first half of the 1960s, an earlier period of low inflation and rapid growth, recent NAIRU studies estimate the economy was at the threshold of accelerating prices by 1963. Yet at that time most economists thought that resources were underutilized and that the economy needed stimulus. In fact, unemployment was steadily reduced without any speedup of inflation until 1966, when the Vietnam war was in full swing. More generally, nowhere have natural rate models worked in periods of low inflation and high unemployment, circumstances in which they predict growing deflation which has never been observed. Nor have they performed particularly well in periods of high inflation. In Europe, the model could only be made consistent with developments over the past two decades by inventing ways to let NAIRU track actual unemployment, which emptied the model of content.

Our New Model

We have developed an alternative to the natural rate model that is based on behavioral assumptions that we find more realistic. They also better fit the facts. The key behavioral assumption that we change concerns the role of expectations in the inflation process. Natural rate models assume that both price and wage setters set prices to exactly offset expected inflation. In econometric estimation this amounts to constraining the effect of expected on actual inflation to be one for one, meaning that changes in expected inflation change actual inflation by the same amount.

Confronting the Fed

The previous controversy in empirical work has been about how to model the formation of expectations so as to formulate and test this assumption. In contrast we see how people use expectations, rather than how they form them, as the key to modeling inflation. We do not accept the standard assumption that people always make the best use of all available information and turn instead to evidence about how people actually use information in making decisions. We recognize that firms and workers are barraged with more relevant information than they can fully process, so that when inflation is low, and thus relatively unimportant for economic decisionmaking, it will be ignored or not given full weight. But when inflation is high it will be the center of attention. This leads us to a model in which the effect of expected inflation on actual wage and price setting will itself vary with the rate of inflation—the effect is small when inflation is low and close to one-for-one when inflation is high.

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That small change to the standard model makes a big difference. In natural rate models, the economy has a unique sustainable rate of unemployment. Attempts to push the economy to lower unemployment rates and higher levels of output inevitably lead to ever higher inflation and, eventually yield no reduction in unemployment. By contrast, we find the economy can operate over a range of sustainable unemployment rates corresponding to a range of low-to-moderate rates of inflation. In our model, the old natural rate idea is a special case that is relevant only at high inflation rates.

The difference is crucial both for how models are specified and estimated, and for understanding the options open to policymakers. For specifying and estimating key relations, estimates that are constrained to produce a NAIRU will underestimate the economy's potential, especially during periods of low inflation. For policymaking, either using NAIRU estimates as a target or pursuing zero inflation—as adherents of natural rate models often advocate—will leave unemployment wastefully high and the economy operating well below its potential. In our own analysis, the lowest sustainable unemployment rate is achieved with moderate inflation and is well below the unemployment rate associated with complete price stability.

We now look more closely at econometric evidence that casts doubt on the NAIRU model and then at the behavioral evidence that calls into question the microeconomic underpinnings of natural rate theory. We then turn to our model and its implications.

Preliminary Time Series Evidence

In practice, NAIRU models assume that people form their expectations of future inflation based on an average of past inflation. This average is used in statistical analysis as the measure of expected inflation and, in NAIRU models, it is assumed to move current inflation one-for-one. In econometric terms, that means expected inflation is constrained to have a coefficient of 1.0 in moving the actual inflation rate. Yet this assumption is not consistent with the data.

William Brainard and George Perry recently estimated a historical relation between inflation and unemployment, commonly known as the Phillips curve, using an unconventional estimation technique that permits all the coefficients of the model to vary over time. While the other coefficients of the model were remarkably stable over the last forty years, the coefficient on expected inflation—which the NAIRU model assumes has a constant value of 1.0—in fact varied considerably. Starting from low values in the low-inflation years before the 1970s, estimates of this key coefficient rose to near 1.0 with the high inflation that accompanied the two OPEC oil price shocks, but then declined again to low values when inflation subsequently fell. Thus, this final NAIRU assumption is approximately correct when inflation is high, but not when inflation is at low to moderate levels.

Whether policymakers reject the conventional NAIRU estimates and prescriptions may determine whether the historically strong expansion now transitions into a soft landing for the economy.

As a preliminary step in our own work, we estimated separate Phillips curves for periods of low and high inflation. We sorted the period from 1954 through 1999 into two samples: low-inflation quarters when the trailing five-year average of inflation in the Consumer Price Index (CPI) was below 3 percent (or, alternatively, 2.5 percent), and high-inflation quarters with this average in excess of 4 percent. The samples have mean inflation rates of 2.0 percent and 6.3 percent, respectively. We then estimated a large number of specifications in which we varied the measure of unemployment and the measure of inflationary expectations. Our findings support the Brainard and Perry results. We consistently found the coefficient on inflationary expectations to be substantially larger in regressions estimated with the high-inflation samples than for the comparable specification estimated with the low-inflation samples.

How People Use Expectations

We now turn to the behavioral underpinnings of our model. Natural rate, or NAIRU, models assume expected inflation is always fully incorporated into the price- and wage-setting decisions of firms and workers. However, a wealth of evidence on actual behavior suggests that this assumption is wrong. For example, psychological studies show that decisionmakers often "edit" the information available to them, ignoring much that is potentially relevant in order to concentrate on the few factors they deem most important. Furthermore,

studies of perception show a stimulus must pass a threshold before it is even perceived, let alone used.

In addition, from interviews with compensation professionals, we infer that wage setters do not behave in the way that most economic models assume. Rather than choosing a real wage target and then adjusting it fully for expected inflation, they mix information about inflation with a variety of other information relevant to wage setting in unsystematic ways that are not likely to yield the result economists assume.

Research by Robert Shiller, reported in a 1997 volume on reducing inflation, and research on money illusion by Eldar Shafir, Peter Diamond, and Amos Tversky, published in the *Quarterly Journal of Economics*, shows that employees systematically underestimate the tendency of inflation to boost their own nominal wages. Therefore, in periods of moderate inflation, so long as their wages do not decline, employees view favorably the salary increases they get and generally remain satisfied with their jobs.

Inflationary Expectations and the New Model

We now sketch how we incorporate expectations into our formal model relating inflation and unemployment. Firms set wages and prices, and workers respond to the wages offered according to their view of job and wage opportunities outside the firm. The crucial issue is how wage and price setting varies with inflation.

Even when inflation is low, some firms' wage and price setting fully incorporates expected inflation. In other firms, wage and price setting responds fully to current conditions in their labor market, but less than fully to expected inflation, perhaps even ignoring it completely. Because all firms adjust to current market conditions each time they set wages, the wage in firms that fail to take full account of inflation trails the average wage, though only by a small, noncumulating percentage. Prices in all firms are a markup over expected unit labor costs. The cost in lost profits from less than complete attention to inflation is negligible when inflation is low, but this cost grows quickly with inflation. As a consequence, the fraction of firms that fully incorporate expected inflation in setting their own wages and prices varies with the inflation rate. In a climate of little or no inflation, a large fraction of firms do not fully adjust their wages and prices, but this fraction declines when inflation rates are higher.

Nearly all the estimates confirm our theory—large, sustainable gains in employment are available by operating the economy at inflation rates moderately above zero.

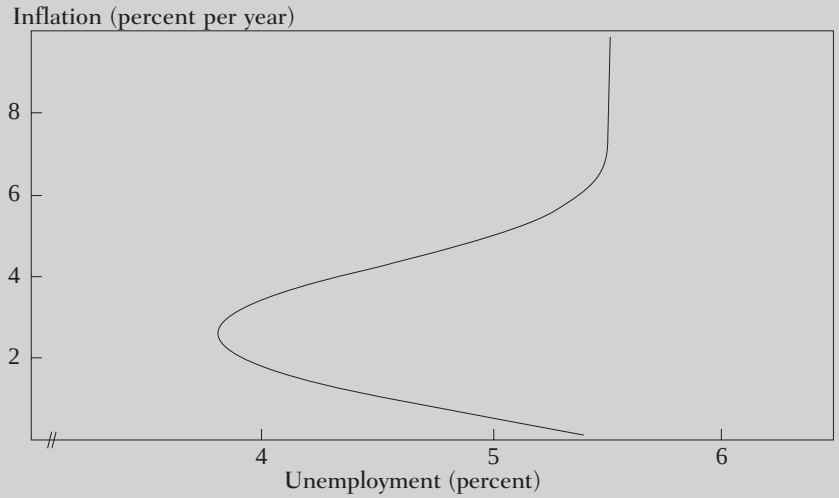
This behavior by firms has important implications for the macroeconomy as illustrated in figure 1, which traces out the trade-off between equilibrium unemployment and inflation for plausible values of the other parameters in the model.

At zero inflation, it does not matter whether firms pay attention to inflation, and equilibrium unemployment corresponds to what would be the conventional natural rate. (In a 1996 study, we showed that at zero inflation, unemployment would be above the natural rate because some inflation is necessary to allow adjustment of relative wages. We ignore that effect here to simplify the exposition of our present model, which focuses on expectation. In reality, both effects are important and coexist.) When inflation is between zero and some moderate rate, higher inflation within this range is accompanied by lower unemployment.

This trade-off reflects two opposing effects. The first effect concerns firms that continue to pay less than full attention to inflation. At a higher inflation rate, the wages and prices of these firms fall somewhat behind those of firms that do pay full attention. As a result, these firms sell more goods and employ more workers than they would if they set their prices higher. The lower prices of their goods also leave consumers with more to spend, increasing demand for the goods of other firms, and raising total employment. The second effect concerns firms that change their behavior. At the higher inflation rate, those firms shift their pricing to fully incorporate expected inflation and, as they do, wages and prices rise more, reducing some of the benefits to employment and output from the first effect.

Figure 1

A Hypothetical Long-Run Phillips Curve



Source: Authors' calculations from calibration of the theoretical model

In the low-to-moderate inflation range, the first effect dominates and higher inflation is associated with lower unemployment. But beyond some inflation rate the second effect dominates and the trade-off goes the other way: higher inflation is associated with higher unemployment.

The left-most point in the graph in figure 1 represents the lowest sustainable unemployment rate. Inflation at this point is moderate but also greater than zero. Unemployment associated either with zero inflation or high inflation is significantly higher. The short-run Phillips curve that follows from this model is one in which the coefficient on expected inflation rises with inflation and eventually approaches one.

Empirical Tests of the Model

We have estimated and tested our model with post-war United States data. The key test is whether the coefficient on expected inflation varies in the way we predicted in our theory. The estimating equation includes a term to capture that effect, if it is in fact present in the data. We specified the term in a variety of ways. We used a number of measures of expected inflation itself, including alternative averages of past inflation as well as direct survey measures of expected inflation, and several alternative measures of unemployment and of price and wage inflation.

In Europe, if policymakers prematurely tighten policies in order to pursue price stability, they are likely to interrupt the expansion before full prosperity has been restored.

The large number of specifications that are available from these combinations of data provide a check on the robustness of our findings. Finally, while all the data we need are available from the first quarter of 1954 through the end of 1999, we sometimes restricted the period of estimation to end in the fourth quarter of 1989 so that the results would not be driven by the 1990s episode of low inflation and falling unemployment.

Nearly all the estimates confirmed our theory and indicated that large, sustainable gains in employment are available by operating the economy at inflation rates moderately above zero rather than either at zero inflation or high inflation. At zero or high inflation rates, the equilibrium in our model corresponds to the natural unemployment rate in conventional models.

To summarize the range of estimates, we calculated the inflation rate associated with maximum employment and the difference between the corresponding unemployment rate and the natural unemployment rate. This difference measures the sustainable gains in employment that are attainable. Not surprisingly, the large number of specifications generates a wide range of point estimates. The densest cluster of estimates spans a range from 1.5 to 3 percent for the inflation rate that maximizes employment in the long run. The estimated unemployment reduction from operating the economy at that inflation rate (rather than at zero or high inflation) falls mainly in the range from 0.5 to 3.0 percentage points.

Guides For Policymakers

Although these estimates provide support for the qualitative features of the model, they do not pin down precise targets for inflation and unemployment. Indeed, it would be unrealistic to seek precise estimates. However, our main results and the departures from conventional natural rate models that they identify appear to be robust and do provide useful guides for policy.

Rather than a unique natural rate of unemployment, the economy has a range of sustainable unemployment rates that are consistent with moderate inflation. Zero inflation is an inappropri-

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ate policy target because it raises the sustainable rate of unemployment by a significant amount. High inflation is bad for the same reason, as well as because of other distortions and inequities. Moderate inflation, which includes the range of experience of recent years, with the core CPI rising at a 2 to 2.5 percent annual rate, allows the economy to operate with low unemployment. Such an inflation rate yields maximum prosperity.

The economy is now slowing from the very rapid growth rates of the past few years. Whether the soft landing that everyone is hoping for can be achieved may well depend on whether policymakers managing this slowdown rely on conventional models and prescriptions that aim for complete price stability or, instead, take account of the analysis described here. That analysis suggests policymakers should aim to maintain the moderate core inflation rates of recent years and avoid the substantial increase in unemployment that conventional NAIRU models suggest is inevitable.

A similar choice confronts policymakers in the new European Monetary Union who have only recently seen their persistently high unemployment rates begin to fall. If they now prematurely tighten policies in order to pursue price stability, they are likely to interrupt the expansion before full prosperity has been restored in Europe.

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