

Rational Expectations and the Invisible Handshake

CAN long-term career or customer relationships, which improve the economic welfare of individuals at the microeconomic level, have harmful macroeconomic side effects that make even a credible monetary disinflation program extremely costly? That they can, and do, is the theme of Arthur Okun's comprehensive theoretical investigation, *Prices and Quantities*. The policy implications of this study are of particular interest today as policymakers appear to have implemented a program of monetary restraint to disinflate the U.S. economy. If accurate, Okun's prediction that "the dynamics of inflation are embedded in the process of wage and price determination and cannot be eliminated solely by fiscal and monetary measures without incurring great losses of output and employment"¹ raises serious doubts about the sustainability of such a program of monetary restraint.

While long-term relationships—invisible handshakes—between workers, firms, and their customers are the main subject of Okun's study, the *expectations* of individuals involved in these relationships also figure prominently in the analysis. This should not be surprising, for long-term relationships do not diminish the importance of expectations in macroeconomic analysis. On the contrary, expectations of the future significantly affect the terms of contractual arrangements. They are of greater quantitative importance in contractual situations than they are in more flexible auction market situations. Okun's analysis certainly recognizes the importance of expectations, but it breaks ranks with much current macroeconomic research by deliberately avoiding the use of *rational* expectations, or efficient forecasting, in the investigation of

I am grateful to Robert E. Hall and George L. Perry for helpful comments.

1. Arthur M. Okun, *Prices and Quantities: A Macroeconomic Analysis* (Brookings Institution, 1981), p. 234.

long-term arrangements. Instead of relying on rational forecasts, the implicit contracts in Okun's analysis have a rigid forecasting clause that is just as slow to adapt to economic change as more conventional aspects of the long-term relationships: "prices and wages are not the result of precise forecasts: indeed, they reflect arrangements that people have sensibly adopted to reduce their dependence on forecasts."² Why is it sensible to avoid the use of precise forecasts in implicit contracts? At least in the wage-setting decision, "forecasting the wages of other firms is complex and costly, and communicating the validity of the forecast to workers may be equally challenging."³

While such a treatment of expectations may be empirically accurate in some cases, it runs counter to recent research on macro models with long-term contractual arrangements where rational expectations have been the benchmark assumption.⁴ It also runs counter to much of the early and more recent microeconomic theory on implicit contracts,⁵ where agents are assumed to know the distribution of possible outcomes and forecast these outcomes efficiently even though their information sets may be asymmetric. This difference raises the question of whether Okun's conclusions about macroeconomic side effects are due to inefficient forecasting rather than to the invisible handshake per se. Would replacing the rigid forecasting clause in the implicit contracts with an agreement to use an efficient forecasting scheme reduce the macroeconomic inefficiencies or eliminate them entirely?

In this paper I examine this question by introducing rational expectations into Okun's macro model with long-term contracting, as presented in *Prices and Quantities*. The analysis indicates that this change in the expectations assumption significantly reduces the macroeconomic inefficiencies. In other words, it is not the invisible handshake that causes many of the macroeconomic difficulties, but rather the forecasting clause in the implicit contract. I make use of results developed in recent

2. *Ibid.*, p. 356.

3. *Ibid.*, p. 97.

4. For example, Stanley Fischer, "Long-Term Contracts, Rational Expectations, and the Optimal Money Supply Rule," *Journal of Political Economy*, vol. 85 (February 1977), pp. 191–205; and Edmund S. Phelps and John B. Taylor, "Stabilizing Powers of Monetary Policy under Rational Expectations," *Journal of Political Economy*, vol. 85 (February 1977), pp. 163–90.

5. For example, Costas Azariadis, "Implicit Contracts and Underemployment Equilibria," *Journal of Political Economy*, vol. 83 (December 1975), pp. 1183–1202; and Sanford J. Grossman and Oliver D. Hart, "Implicit Contracts, Moral Hazard, and Unemployment," *American Economic Review*, vol. 71 (May 1981, *Papers and Proceedings, 1980*), pp. 301–07.

research on rational expectations models with unsynchronized wage setting.⁶ I proceed by showing that the Okun model (at least by my interpretation) closely resembles the staggered wage-setting model considered in this research. The primary differences are in the expectations assumptions, as is shown in some detail below.

How should these results be interpreted in practice? What do they suggest about an appropriate research strategy in this area? One approach is to dismiss the rational expectations assumption as empirically inaccurate or too speculative for practical policy analysis and continue to rely on rigid extrapolative forecasting rules. A second approach is to dismiss the wage- and price-setting model as too simplistic or just incorrect: something must be wrong with the model if merely changing an expectations assumption eliminates the costs of disinflation. A third approach—which is emphasized here—is to recognize that there may indeed be serious barriers to the use of optimal forecasts of wages and prices that are responsive enough to achieve the macro efficiencies that the rational expectations approach suggests are feasible, but also to recognize that these barriers might be lowered or removed through public policy. Rational forecasting may indeed be too costly to justify implementation by individual firms and workers, or even by large corporations or labor unions. Moreover, it may not be wise for firms or workers to expect that other firms or workers are using the *same* forecasting model that they are using. And the macro policy that underlies the rational forecast may not be credible. This credibility barrier to rational expectations has already received serious attention in practical policy discussions, usually taking the form of monetary reform proposals that would force the macroeconomic policymakers to be credible. The analysis that follows suggests that attention should also be placed on the first two barriers if significant improvements in macroeconomic efficiency are to be achieved.

A Macro Model with Long-Term Contracts

In chapter 3 of *Prices and Quantities* a simple macro model of aggregate wage dynamics and unemployment fluctuations is introduced to illustrate the process of inflation in a world of long-term contracts.

6. Edmund S. Phelps, "Obstacles to Curtailing Inflation," in James H. Gapinski and Charles E. Rockwood, eds., *Essays in Post-Keynesian Inflation* (Ballinger, 1979), pp. 179–93; and John B. Taylor, "Aggregate Dynamics and Staggered Contracts," *Journal of Political Economy*, vol. 88 (February 1980), pp. 1–23.

Unsynchronized, or staggered, wage setting in which wage decisions are made relative to a prevailing wage is a central feature of the dynamics of this model, which seems to capture much of the microtheoretic rationale for implicit contracts. As this model is the target of my rational expectations treatment, some brief discussion about how it relates to recent work on contract theory is in order.

Contract Theory and Staggered Wage Setting

Implicit contract theory of labor markets has generally been cast as an arrangement whereby firms stabilize fluctuations in the real wage as part of a risk-sharing agreement with workers, which potentially takes account of asymmetric information and moral hazard. Hall has argued persuasively that such long-term arrangements are empirically relevant and that their micro efficiency (given the shifts in firms' productivity) should be taken seriously.⁷ As Hall, Grossman and Hart,⁸ and others have pointed out, however, such "real" contracting cannot explain why changes in the money supply have real effects, as would be the case in a costly disinflation. Accordingly, contract theory apparently cannot explain the macroeconomic inefficiencies with which I am concerned here.

Although these issues are still unresolved, there is a reinterpretation of the contract-theoretic results that is appropriate for the type of model of staggered wage setting considered here. It does not seem to violate the spirit of the implicit contract model to reinterpret it as an insurance arrangement that provides stability of the wage *relative* to the going wage received by similar workers. If workers are at all mobile, the current wage received by other similar workers represents the appropriate opportunity cost of working in the current firm. If moving is costly (or if threatening to move in order to capture the appropriate market wage is costly), firms will be ready to provide an implicit contract benchmarked to this going wage. An advantage of relative wage insurance is that the circumstances under which the firm must renege on its contract correspond to the situation where the firm must leave the business: if the firm cannot meet the going wage (cannot fulfill its contract) and generate positive profits, then it will not be in business. Real wage

7. Robert E. Hall, "Employment Fluctuations and Wage Rigidity," *Brookings Papers on Economic Activity*, 1:1980, pp. 91-123.

8. *Ibid.*; and Grossman and Hart, "Implicit Contracts."

stabilization does not have this feature. A renegotiation of the contract is called for when the guaranteed real wage does not generate positive profits while a wage payment at the prevailing wage does. Relative wage contracting is therefore more sustainable.

These contracted changes in relative wages are likely to occur in an unsynchronized and staggered fashion, because firms will find they can achieve their desired relative wage with more certainty if the prevailing wage is predetermined. In a situation where each firm would like to go last a competitive equilibrium could plausibly evolve in which wage setting was fairly evenly staggered over time. Okun mentions that this temporal equilibrium is much like a spatial equilibrium in location theory, although this has not yet been worked out formally.

An efficient *relative* wage contract would probably entail some variation in the relative wage even if that variation was less than in the auction market. For example, Arnott, Hosios, and Stiglitz have developed an implicit contract model with layoffs, quits, and job search.⁹ They show that the optimal contract will stipulate a reduction in the wage relative to the expected prevailing wage when marginal productivity is low, as in the case of a slump in the demand for the firm's product. An analogous argument suggests that, when unemployment is low and expected search costs are accordingly reduced, firms will find it efficient to bid up their wage relative to the expected prevailing wage.

How can such a setup generate macroeconomic inefficiencies? Relative wage contracting can generate a path for the *nominal* wage that is not directly related to current economic conditions. If nominal wage payments require some transactions medium, there will be a direct demand relationship between these payments and the quantity of transactions balances—much like Keynes's demand for money in terms of wage units. Hence, changes in the nominal wage path can reduce total expenditures if the supply of money does not change by the same percentage. Moreover, reductions in the growth of the money supply will have real effects because the path of nominal wages is given at any point by the recently set relative wage contracts. Real wage movements are not a central part of this mechanism. Prices can be determined as stable markups over costs, as implied by Okun's customer relations model, in which case the aggregate price level will follow the aggregate

9. Richard J. Arnott, Arthur J. Hosios, and Joseph A. Stiglitz, "Implicit Contracts, Labor Mobility, and Unemployment," working paper (Princeton University, 1980).

nominal wage fairly closely, reinforcing the contractionary effects of a decline in the growth of the money supply. In that case real wage movements play no role in the analysis. Although this approach is considerably different from the mechanism in the "neo-Keynesian synthesis," it does generate results consistent with the insignificant empirical role of real wages in the business cycle. In this framework an increase in the nominal wage reduces aggregate employment simply by reducing real balances (measured in terms of both the aggregate price level and the aggregate wage level), assuming a less than fully accommodative monetary response. This differs from the "neo-Keynesian synthesis" explanation where an increase in the nominal wage would increase the real wage and reduce firms' demand for labor.

Alternative Wage-setting Rules

To simplify the algebraic treatment of this unsynchronized nominal wage contracting, assume that there are annual wage changes with half the workers changing their wages in January and the other half in July (Okun's tabular example has one-fourth of the contracts changing each quarter). Let x_t be the log of the contract wage set in period t to last through period $t + 1$. The log of the geometric average wage is given by $w_t = \frac{1}{2}(x_t + x_{t-1})$. The framework and notation correspond with that in my earlier work,¹⁰ except that the procedure for setting the contract wages and the corresponding expectations mechanism has yet to be specified.

Okun considered two different wage-setting rules for this model. Each depends on the expectations assumption used. To describe these rules one must introduce Okun's notion of the "reference" wage, which is the average of existing wages outstanding at the time the wage is determined. Note that the reference wage is different from the "prevailing" wage relevant to wage decisions made in period t . The prevailing wage for a given contract decision will depend partially on the upcoming wage decision of other workers, while the reference wage is simply a function of past wage decisions. In this two-period version of the model the reference wage for workers or firms deciding on wages in period t is

10. Taylor, "Aggregate Dynamics."

x_{t-1} , the wage determined six months earlier. The prevailing wage is $\frac{1}{2}(x_{t-1} + x_{t+1})$.

The wage-setting rules considered by Okun (in the absence of a motivation for a relative wage change) are given in the form

$$(1) \quad x_t = x_{t-1} + \frac{1}{2}g,$$

where g is the forecast of the change in x_t over the length of the contract. By definition,

$$(2) \quad g = x_{t+1}^e - x_{t-1},$$

where x_{t+1}^e is the forecast of the wage decision in the next period, x_{t+1} . According to equation 1, the wage decision is to raise the current wage over the reference wage by one-half of the projected increase in the reference wage. That rule 1 makes sense when no relative wage change is desired is most easily shown by substituting equation 2 into 1. This gives

$$(3) \quad x_t = \frac{1}{2}(x_{t-1} + x_{t+1}^e).$$

Thus rule 1 is a way for workers to match the average prevailing wage over the life of the contract. (The second six months of the wage, x_{t-1} , is in effect during period t , and the first six months of the wage, x_{t+1} , is in effect during period $t + 1$.) According to equation 3, workers can expect to stay even on average, although they will be ahead in the beginning and behind at the end.

Note that x_{t+1}^e is not a rational expectation in Okun's model. Okun's two wage-setting rules are derived by placing specific extrapolative assumptions on x_{t+1}^e or equivalently on g . One extrapolative assumption is that the reference wage is forecast to grow at the same rate over the next year as it did over the past year. This results in the wage-setting rule given by

$$(4) \quad x_t = x_{t-1} + \frac{1}{2}(x_{t-1} - x_{t-2}).$$

Equation 4 will keep workers even under a steady inflation rate in which it is rational to extrapolate next year's increase in the reference wage as equal to this year's increase. But if inflation of the reference wage is expected to increase or decrease, equation 4 will not be rational.

Another wage-adjustment mechanism suggested by Okun is simply to increase the current wage relative to its previous level by the same

amount that the reference wage was most recently adjusted. Algebraically this procedure is represented by

$$(5) \quad x_t = x_{t-2} + (x_{t-1} - x_{t-3}).$$

That is, workers setting wages today get an increase $(x_t - x_{t-2})$ equal to the increase $(x_{t-1} - x_{t-3})$ obtained by workers who most recently had a wage adjustment. Equation 5 is of particular interest because it corresponds with many casual interpretations of wage change. That is, unless there is a shift in labor market conditions caused, say, by a recession, workers will continue to match the wage gains of workers who immediately preceded them. Equation 5 has the interesting property that it preserves the differential between the current wage and the *reference* wage under any inflation pattern. That is, if workers were d percent above the reference wage when they previously changed their wage, they will remain d percent above the reference wage by using 5. If

$$(6) \quad x_{t-2} - x_{t-3} = d,$$

equation 5 implies that

$$(7) \quad x_t - x_{t-1} = d,$$

regardless of the path of wage rates. It is therefore possible to see how 5 could become a rule of thumb incorporated in an implicit contract. Under a steady inflation workers might get used to the idea of always jumping ahead of the reference wage by a fixed percent, and for a time under a higher rate of inflation they might not change this clause of the contract. But eventually workers would see that their wage relative to the more relevant *prevailing* wage was not constant and would attempt to change their contract. Okun's analysis does not rule out such changes. It does argue that they will occur only gradually, however. If the consensus forecast was that the rate of inflation would change in the future, Okun's analysis would not predict any change in equation 4 or 5. Only by observing over a period of time that they were doing poorly relative to the prevailing wage would workers insist on a change in the forecasting rule implicit in their contract.

To generate wage and employment dynamics it is necessary to consider shifts in one of these two wage-setting rules. Wage-setting mistakes or shocks, for example, could be captured by adding a random disturbance term to these rules. More important, relative wages will have to move when the labor market conditions faced by the firm change.

This can be captured algebraically by adding the unemployment rate as a proxy for these labor market conditions to any of the three equations. (It may be plausible to add the *expected* unemployment rate over the life of the contract to these equations, but for the purposes of this analysis the addition of only the current unemployment rate will do just as well.)

Macro Efficiency Issues

It is easy to see how the wage-setting equations 4 and 5 can lead to real output loss even under a credible monetary disinflation program. Suppose that the rate of money growth is reduced steadily from recent levels in order to disinflate the economy. According to either 4 or 5, wage inflation will not be reduced unless the rate of unemployment (which is now envisioned as a term on the right-hand side of these equations) rises, causing firms to attempt to bid down their wages relative to the prevailing wage. There is, of course, a natural mechanism in the model to generate the rise in unemployment. As money growth is reduced relative to the given growth rate of wages and prices, real balances will fall and interest rates will rise, cutting off the demand for goods and forcing firms to lay off workers. Equations 4 and 5 show that this loss in employment is inevitable. Only changes in these equations—changes in the contract—will prevent it, and according to the interpretation of these equations, this can only occur after a period of observation.

Now suppose that expectations are rational so that x_{t+1}^e in the basic wage-setting equation 3 is an unbiased forecast, given information about policy. It is important to note that no other changes have been made in the model—only the extrapolative rules have been replaced with a rational forecasting scheme. To make the effect of this change as dramatic as possible, suppose it becomes generally known that wage levels starting in period $t + 1$ will be stabilized at the current level of the most recently set wages. For example, suppose that a wide commodity standard is introduced whereby the monetary authorities are expected to stabilize the aggregate price level in period $t + 1$ at the current level. By the markup assumption, this means that the rational expectation of x_{t+1} will equal x_{t-1} , assuming credibility of the program. According to equation 3, the appropriate wage adjustment for workers setting their wage in period t , the date the plan is announced, is simply to match $x_{t-1} = x_{t+1}^e$. They adjust their wage from x_{t-2} to x_{t-1} . If inflation has been proceeding at a 10 percent annual rate, workers in period t will receive a 5 percent

wage adjustment, and workers in all subsequent periods will experience zero wage inflation. The disinflation process lasts no longer than the length of the longest contract (one year) and requires no increase in unemployment—equation 3 holds as an identity throughout. Phelps has shown how this same possibility exists in a more general model.¹¹ Of course, this price-standard example is probably too extreme. I have shown that a gradual program of *monetary* restraint will generate some output loss, but because of the adjustments in x_{t+1}^e (which are feasible with rational expectations), this loss will be considerably less than in the nonresponsive expectations case.¹² By announcing the monetary disinflation far enough in advance, it is possible to make these losses negligible. The analogy with these previous results can be made under the interpretation that Okun's model reduces to equation 3, which with rational expectations is identical to the staggered contract model used in this earlier research.

A Qualification Concerning Policy Accommodation

Both of the simple policy examples of the previous section avoid the issue of unforeseen random events that force a change in the program either before or after the disinflation. Suppose, for example, that during the monetary disinflation there is an unanticipated price shock (for example, a run-up of energy prices). In both the extrapolative and the rational expectations versions of the simple macro model, the monetary authorities will have to make a decision about whether to accommodate this shock. If they do not accommodate, or if they only partially accommodate, both models suggest that there will be a decline in employment and output as real balances are reduced when this shock first bids up the price level and is then forced out of the system. Although the rational expectations version of the model indicates that (if this nonaccommodative strategy in response to future shocks is correctly anticipated) the employment effect will be smaller than without rational expectations, the macro side effects do not disappear. When future price shocks are included, therefore, a trade-off between output and price fluctuations remains if policy is committed to maintaining a price target consistent with zero average inflation in the long run. Evidently some of the macro efficiencies persist.

The difference between this example, where the price target is

11. Phelps, "Obstacles to Curtailing Inflation."

12. Taylor, "Aggregate Dynamics."

maintained (even if deviations are permitted in the short run), and the disinflation example of the previous sections is that the *level* of wages and prices must be maintained. With a positive shock, this requires a *decline* in average nominal wages or prices toward their long-run targets, which is not required for disinflation. This return to the target wage or price levels requires a temporary deviation of employment from full-employment levels, which is unavoidable with the long-term contracts of the previous section, even with rational expectations.

One resolution to this qualification is to forget the notion of a *price-level* target for future policy and to stipulate that policymakers aim only for a zero inflation rate: that they fully accommodate any price shock by ratifying the new price or wage level but then commit themselves to remaining at this new price level. The difficulty is that the policy is unable to distinguish between exogenous shocks that bid up wages and prices and endogenous increases in wages and prices that are made in expectation of a fully accommodative strategy. If policymakers are expected to accommodate price and wage shocks, they will also be expected to accommodate endogenous increases in wages and prices. Hence it does not seem possible to discard the notion of a *price- or wage-level* target and maintain credibility about a zero inflation target.

Another resolution is to argue that the implicit contract mechanism itself will adapt and thereby offset any macroeconomic inefficiencies that result from a less than fully accommodative strategy. Perhaps the contracts will change to permit larger relative wage adjustments, for example, so that employment fluctuations do not increase with the less accommodative strategy. Implicit contract theory and the simple macro models that try to reflect this theory are not yet sophisticated enough to predict whether such an outcome is possible. But such adaptation requires changes in the implicit contracts themselves rather than changes in the forecasting schemes considered in previous sections. These changes in the long-term relationships could make them less efficient at the micro level. But this is an open question.

Testing for “Forward-looking” Wage Setting

The model outlined above requires that firms and workers be forward-looking in their wage settlements so that they keep even with the prevailing wage during the term of the settlement, unless changes in the relative wage are desired for economic reasons. In the extrapolative

version of the model firms and workers look forward by looking backward, and in the rational expectations version they look forward by using rational forecasts. In both models, however, workers and firms are assumed to be forward-looking in their wage-setting goals. In this section I show how this assumption might be tested, given an expectational assumption. Although the tests could be carried out conditional on an expectational assumption, only the rational expectations assumption is dealt with here. The test procedure is directly analogous to that used by Sargent to test the expectations theory of the term structure of interest rates using the rational expectations assumption.¹³

A more general form of equation 1 or 3 that leaves open the forward-looking assumption is given by

$$(8) \quad x_t = (1 - f)x_{t-1} + fx_{t+1} + h_t,$$

where f represents how forward-looking wage settlements are, and h is a proxy for expected labor market conditions during the period of the set wage. In empirical applications h_t could be related to the employment rate. Suppose for the purposes of conducting the test that $h_t = -\gamma(u_t^e + u_{t+1}^e)$, where γ is a parameter and u_t is the unemployment rate. The main concern here is with testing the null hypothesis $H_0: f = \frac{1}{2}$, which is the assumption made in the previous section. Obviously, if $f = 0$, there is no forward looking and, whether expectations are rational or not, disinflation will be costly.

The test procedure is to estimate an unconstrained time series process, such as a vector autoregression, for x_t and u_t . Equation 8, under the assumption of rational expectations, will place constraints on this estimated time series process. The constrained versus the unconstrained version can be compared with a standard F -statistic. In research that is still under way I have run tests of this kind using quarterly data from Canada, where contract wages corresponding to the contracts x_t are available for much of the postwar period, and have found that it is generally difficult to reject the hypothesis that $f = \frac{1}{2}$. But the point I wish to raise here is that this result is quite general and is unlikely to be specific to a particular country. The unconstrained vector autoregression for x_t and u_t generally has a form where the lagged cross effects between u_t and x_t are small and the lagged dependent variable coefficients in each

13. Thomas J. Sargent, "A Note on Maximum Likelihood Estimation of the Rational Expectations Model of the Term Structure," *Journal of Monetary Economics*, vol. 5 (January 1979), pp. 133-43.

equation are large. Moreover, when x_t is entered into the equations in first difference form, the lagged dependent variable is very close to 1. To a first-order approximation, therefore, the unconstrained vector autoregression has the form

$$(9) \quad x_t - x_{t-1} = x_{t-1} - x_{t-2},$$

and

$$(10) \quad u_t = \alpha u_{t-1},$$

where for the sake of illustration only one lagged term is considered in the unemployment equation. The approximation in 9 and 10 has simply set the coefficient of the lagged unemployment rate in the wage equation and the coefficient of the lagged contract inflation rate in the unemployment equation to zero, since these are generally small and do not significantly affect the results. According to equation 9, the rational forecast of future x_t conditional on past observations is given by

$$(11) \quad x_t^e = 2x_{t-1} - x_{t-2},$$

and

$$(12) \quad x_{t+1}^e = 3x_{t-1} - 2x_{t-2}.$$

These can be substituted into 8 to obtain

$$(13) \quad 2x_{t-1} - x_{t-2} = (1 - f)x_{t-1} + f(3x_{t-1} - 2x_{t-2}) + \gamma\alpha(1 + \alpha)u_{t-1}.$$

In this example, the parameter f is identified and can be obtained by equating the coefficients of either x_{t-1} or x_{t-2} on both sides of equation 13. Both equations yield $f = \frac{1}{2}$. The value of α does not matter. As long as the joint process for x_t and u_t is a form that is close to 9 and 10, the value of f is close to $\frac{1}{2}$, the assumed value in the preceding section. This illustration explains why the result $f = \frac{1}{2}$ is likely to be quite general: equations 9 and 10 are close approximations of the wage and unemployment dynamics in many countries.

The Usefulness of the Rational Expectations Assumption

While the previous section gives some evidence of forward looking in wage determination, it does not prove that this forward looking is not achieved by simple extrapolation. In fact, the autoregressive model of

equation 9, which is taken to be representative of postwar time series data, is perfectly consistent with the extrapolative rule suggested by Okun and shown here in equation 5. The correspondence between equations 5 and 9 illustrates the difficulty of testing for rational expectations in this context. There seems to be no substitute for direct evidence on *how* firms and workers arrive at their forecasts of future wages relevant to their wage decision. This requires careful survey studies to examine the forecasting *process*, not merely surveys of the forecasts themselves. The forecasts reached are subject to the same identification problems that the comparison of 5 and 9 suggests.

An alternative, perhaps more constructive, approach that may generate large social benefits, given the discussion in the first section, is to begin thinking about how the expectations process in wage formation might be made more rational. Little would be lost by such a strategy if firms and workers were already behaving as if they were rational forecasters, but much would be gained if they were not.

Recent efforts to make macro policy, and particular monetary policy, more credible can be interpreted as efforts to encourage firms and workers to be more accurate in their forecasting by paying attention to the future implications of a credible policy. For example, one group of economists has recently suggested that the members of the Board of Governors of the Federal Reserve System submit their resignation to the president if they miss their announced deceleration program.¹⁴ Those who argue for a gold or general commodity standard have similar aims. Recent discussions about balancing the federal budget seem to have the main objective of showing that future money growth will not be necessary to finance the deficit and thereby make the stated monetary deceleration program more credible. Whatever one thinks about the effects of such proposals, it seems clear that there are substantial advantages to achieving credibility.

Serious consideration might also be given to other ways of increasing forecasting accuracy. There are two potential barriers to the use of rational expectations in practice, which in principle could be overcome. First, the costs of using sophisticated forecasting procedures are unlikely to generate sufficient benefits for an individual firm or worker, even though, as shown above, the social benefits are large. Second, the use

14. "Shadow Open Market Committee, Policy Statements and Position Papers," unpublished report, University of Rochester, 1981.

of rational expectations requires some consensus on how inflation is generated and the dynamics of this process. Without such a consensus firms may not think that other firms are using rational forecasts.¹⁵ Unfortunately, the current lack of consensus among economists makes such a possibility seem dubious. It is possible that the kind of macro model formulated in Okun's book, but augmented with more optimal (rational) forecasting on the part of firms and workers, might form the basis of such a consensus. Such models have received, and continue to receive, extensive attention by microeconomists in the literature on implicit contracts, and are very similar to the staggered contract models with rational expectations that are already close to being formulated for detailed structural econometric work.

Concluding Remarks

This paper has argued that many of the macro inefficiencies—such as costly monetary disinflation—generated by the long-term contract models in Okun's book are due to the rigid extrapolative forecasting clauses in these contracts rather than to the restrictions the contracts place on wage and employment variation. The practical importance of this argument for actual disinflation policy depends on the accuracy of the rational expectations assumption. The results suggest that methods be investigated under which public policy encourages the use of efficient forecasting, such as making macroeconomic policy more credible. The development of theoretical and econometric models along the lines suggested in Okun's book, but augmented when appropriate with rational expectations techniques, appears to be a necessary part of any such effort.

Comment by Robert E. Hall

ONE OF the many things Arthur Okun drummed into my head was that the inertia of wages was not necessarily related to expectations. In a way, Taylor's paper makes the same point. If inertia comes from some other source, the current emphasis on the credibility of anti-inflation policy

15. See Edmund S. Phelps, "The Trouble with Rational Expectations and the Problem with Inflation Stabilization," working paper (Columbia University, 1980).

may be misplaced. Until inertia is better understood, we should be cautious in advocating aggressive anti-inflation policies.

Taylor begins by reminding us of a central implication of rational expectations. Suppose a fully credible anti-inflation policy is announced sufficiently far in advance that all wage-price contracts and other arrangements with allocative significance can respond to the announcement before it takes effect. Then no real effects should follow—the policy should operate only on prices and wages.

Taylor then cites Okun's two major objections to this proposition. First, the full forecasts it presupposes are too expensive, especially if you count as part of the expense the effort to convince individual workers that the forecasts are correct. Second, the full disinflationary response requires that each economic agent believe that everyone else is fully rational.

It seems to me that Taylor, following Okun and numerous other authors on this subject, takes a lot for granted about the form of labor contracts and other aspects of wage determination.

First, contracts are viewed as setting wages that have an allocational role. Once the wage is determined through the operation of the contract, firms set the level of employment by equating the marginal revenue product of labor to the wage. The polar opposite view thinks of employment as very long term and current wages as nothing more than installment payments on a long-term obligation. Although I think the evidence favors a considerable short-term allocative role for wages, the point deserves much more investigation and debate than it usually receives in this kind of discussion.

Second, according to Taylor, a major goal of contracts is to stabilize wages relative to wages earned by other workers. Preserving wage relationships takes precedence over keeping wages low enough to provide employment for all the workers covered by an agreement. I am not persuaded that the evidence requires us to invoke a noneconomic role for outside wages. The economic links across sectors in the labor market can be strong. Wages in alternative employment determine the opportunity cost of workers' time. One of the puzzles of U.S. labor markets, in fact, is the evident lack of formal indexation to wage indexes.

Third, everything in the Okun-Taylor line of thought depends on the inability to make contingent contracts. Management and labor cannot make wages respond to events as they occur. Instead, they have to rely on forecasts made at contract time. Rational expectations would not

matter under fully contingent contracts. The absence of contingencies in labor contracts other than cost-of-living indexing remains a mystery, though a good deal of thinking about this has been done recently. Information limitations and moral hazard block many attractive procedures. Contract contingencies can interfere with unrelated aspects of the employment relationship—for example, making wages contingent on outside wage offers gives workers incentives to train themselves for other jobs even when their comparative advantage will remain in their current jobs.

Taylor's discussion assumes a fairly brief contract period. But many aspects of the employment contract must last as long as the employment itself, which is often many decades. Annual or triennial wage discussions may take place in such a constrained setting that they cannot respond effectively to new economic conditions. If so, the contract period is really much longer and the response of wages to demand much more sluggish than Taylor indicates.

At the end of the paper, Taylor suggests that the social costs of wage mistakes far exceeds the private costs. Except for the usual distortions from unemployment insurance and income taxes, it is not clear to me what creates the externalities he has in mind. The major costs of underemployment fall precisely on the underemployed.

Taylor's paper is a helpful review of some important and unsettled issues. As unemployment rises in Britain and the United States to levels unprecedented since the depression, we are reminded of how central these issues are.

Comment by George L. Perry

JOHN TAYLOR'S treatment of rational expectations in wage and price determination can be divided into two parts. First, how the world works: is rational expectations a useful way to describe the behavioral process in this area of economic decisionmaking? And second, how the world could be made better: would encouraging the use of rational expectations in this process improve macroeconomic performance?

On how the world works, Taylor is formally agnostic. He suggests that under one general technique for trying to explore that question—vector autoregression—one will never get a clear verdict because the rational expectations will always be approximated by a simple extrapo-

lation of the most recently observed wage (or price) increases. Because such a simple extrapolation is a plausible rule for a world in which expectations, as such, are not normally important to wage setting, the rational forward-looking model cannot be distinguished from alternatives. Indeed, the rational expectations rules in Taylor's equations 11 to 13 look just like a sluggish wage norm formulation.

When I tried my hand at distinguishing between forward- and backward-looking behavior using data from long-term labor contracts, I found that wage setting was better explained by backward-looking catch-up behavior than by a *good* forecast of the future. Logically, that does not rule out forecasts as a factor in wage setting. But it does imply that, if they are a factor, the forecasts are made by extrapolating the past rather than by some superior technique that provides better forecasts of the future.

The proposition that wage setting does not seem to involve good forecasts has relevance for whether forecasts are important in the process at all. Although some formal properties of rational expectations macro models require only that expectations be unbiased and efficient, in practice they should also be good forecasts by some standard. If they are not, nobody will attach any importance to them. This observation supports Okun's argument that simple, backward-looking wage setting is optimal under the implicit contracts sealed by the invisible handshake.

As I interpret his paper, Taylor leans toward the position that rational expectations have not been important in wage setting, for he devotes himself to considering how they might be made important, thus improving macro performance. I believe his simple model, which is appropriate and valuable in highlighting the difference between inertial and expectational views of wage setting, becomes deceptively simple when applied to this second task.

Taylor illustrates the improvement available in macro performance by allowing rational expectations to guide wage setting according to his equation 3. He then assumes that policymakers, in period t , convince the world that wages set in $t + 1$ will be set at the same level as in $t - 1$. Sure enough, the wages set in t are then also set at the level of those set in $t - 1$, and disinflation is painlessly achieved. But surely the assumption begs all the interesting questions.

What do the wage setters expect policy to control? The money supply, fiscal policy, nominal GNP, and unemployment are all more plausible answers than the wage level. The variables most easily controlled are

the furthest from the wage level in most macroeconomic models, and the connection between them and wages is the weakest. Thus the first problem is how to convince today's wage setters that wages will be low tomorrow.

On top of this basic difficulty, the proximate aims in wage setting are almost surely very different from those Taylor describes. If one alters the form of his equation 3 so that current wage setting is dominated by the desire to match prevailing *rates of increase* in wages and attempts to align wage *levels* are only secondary, the disinflation process looks much different. If wage setting has one component that applies to relative wage levels and is affected by unemployment and another component that is governed by the prevailing norm for rates of wage increase, then even if rational expectations could affect the first component, as Taylor indicates, it would have little effect on the total actual wage change.

This formulation is not artificial. Most wages are set at least annually and keeping up with the prevailing rate of wage inflation involves little risk of serious error in that length of time. These wages are fixed for too short a period to make expectations in contract theory a crucial part of the wage model. Wages set in three-year cycles—a period over which a forecast error would make a much bigger difference—are in fact conditional contracts with escalators that minimize the need to forecast inflation.

Let me now put aside these reservations about the process and stick to Taylor's premise that expectations are truly a central element in wage setting. He emphasizes that increasing credibility is the best hope for changing the wage-setting relation in the appropriate way. Although it has not mattered in the past, one can make the promise of disinflation matter and get wage setters to take notice in the future. Economic relations will shift, and the credibility hypothesis is a plausible story about how a predictable shift in the inflation relation might be engineered.

Taylor makes no excessive claims or optimistic forecasts for this strategy, but he does argue that it should be tried because there is nothing to lose and possibly a lot to gain. Then, as concrete examples of his strategy, he cites recent efforts to enhance credibility by (1) putting the jobs of the Federal Open Market Committee on the line, (2) adopting a gold standard, and (3) committing fiscal policy to a balanced budget.

Some of these proposals are worse than others. But as examples of the sorts of "innocuous" things we might do to give Taylor's model a fair chance, they make one long for the 1970s as an example of the good

old days. And while I am aware of their many imperfections, I am puzzled that, in this imperfect world, Taylor does not mention tax-based incomes policy or other forms of incomes policy as a useful aid to credible disinflation. Although practical objections to them have stressed worries that imply backward-looking behavior—there is no fair time to institute such policies because new wage-setting agreements need to catch up to what has happened elsewhere in the economy—Taylor's model seems to cry out for such policies because they would help fix expectations about future wage changes.

In more than one view of the world, including both the credibility variant on rational expectations and more backward-looking explanations for inertia, a plausible hypothesis about how the inflation relation has shifted in recent years can include the success of stabilization policy in the postwar period, particularly before the supply shocks of the 1970s came to dominate economic performance. The credibility hypothesis must attempt to persuade wage setters that the pursuit of real stabilization is being abandoned in favor of a different goal. Maybe that would be a useful one-shot policy, aimed at helping us down from the present inflation plateau. But why would it be of any lasting value in shifting the inflation relation unless we *maintained* the expectation that real stabilization and high employment were no longer objectives of policy. To credibly maintain that expectation, policy would have to deliver on it. But why would we want to? Why should we favor, in general, inflation goals rather than goals for output?

Of course, some new classical models maintain that the problem of choosing between stabilizing prices and quantities does not exist. But within the more reasonable confines of Taylor's paper, it does. And a recent paper by Charles L. Schultze shows that the cyclical division of GNP into real and price changes has not altered much under all the different peacetime policy regimes of this century.¹⁶ It appears to take extreme and extended periods of cyclical boom or bust to change that division. This adds evidence to the proposition that, rather than relying on the single-minded pursuit of price stability to achieve both output and inflation objectives, we should be looking elsewhere for improvements in macroeconomic performance.

16. "Some Macro Foundations for Micro Theory," *Brookings Papers on Economic Activity*, 2:1981, pp. 521–76.