SOME CURRENT CONTROVERSIES IN THE THEORY OF INFLATION

Thomas M. Humphrey

The theory of inflation is currently in an unsettled state. Largely discredited by recent episodes of stagflation in which joblessness and prices rose simultaneously, the once-dominant concensus view of a stable Phillips curve trade off between unemployment and inflation has given way to a host of competing explanations. Today a variety of issues relating to the causes, transmission, and control of inflation are being debated. A careful sorting-out of these issues and a clarification of the rival claims and distinctive features of competing schools of thought may prove useful.

The purpose of this article is threefold. First, it develops a general classificatory framework within which particular issues can be organized and examined. Second, it uses this framework to survey some of the main debates that are current in contemporary discussions of the problem of inflation. Third, it identifies four distinct theories that emerge from these debates, specifies their distinguishing characteristics, and comments on the plausibility and relevance of each theory.

The Four-Equation Framework The basic framework employed in this article consists of four relationships of the type that appear in many aggregative models of the inflationary process. These relationships are derived from the underlying market demand and supply equations that constitute fairly complete general equilibrium models of the economy. The relationships include (1) a wage equation explaining how the rate of increase of nominal wages is determined; (2) a price equation specifying how the rate of price inflation is determined; (3) a price-expectations equation explaining how people formulate their expectations about the future rate of inflation; and (4) a demand-pressure equation that describes how the level of excess aggregate demand —measured in terms of either output (relative to normal capacity) or unemployment—is determined.

In its most general form, the basic classificatory framework can be written as follows.

1. WAGE EQUATION:
   $w = w[p_L, p^e_L, x_L, z_L]$.
2. PRICE EQUATION:
   $p = p[w_L, p^e_L, x_L, z_L]$.
3. PRICE-EXPECTATIONS EQUATION:
   $p^e = p^e[p_L, z_L]$.
4. DEMAND-PRESSURE EQUATION:
   $x = x[(m-p)_L, f_L, z_L]$.

Here w is the percentage rate of change of nominal wages; p is the percentage rate of change of prices, i.e., the inflation rate; p^e is the expected future rate of change of prices, i.e., the anticipated rate of inflation; and x is the level of excess demand, no distinction being made between labor and product markets.[1] The variables m and m—p are the percentage rates of change of the nominal and real (price-deflated) money stocks, respectively, and f is the fiscal policy variable represented by the size of the government's budgetary deficit. The variable z is the vector of cost-push forces including such factors as trade-union militancy, monopoly power, and the political commitment to the goal of full employment and the consequent removal of the fear of unemployment as a factor constraining wage demands. The subscript L represents time lags denoting that the dependent variables may be influenced by lagged as well as contemporaneous values of the independent variables.

In the above framework, the wage equation states that the rate of money wage increase is determined by the actual and anticipated rates of rise of the cost of living, the excess demand for labor, and cost-push forces. The price equation

[1] It is not necessary to specify separate excess demand variables for the product and labor markets since the two measures are assumed to be linearly related. Excess demand in the product market is measured by the gap between actual and potential (i.e., normal or standard) output. Excess demand in the labor market is measured by the difference between the actual and natural rates of unemployment, where the latter is the rate that, given the inevitable frictions, rigidities, and market imperfections existing in the economy, is just consistent with demand-supply equilibrium in the labor market. The linear relationship between the two measures permits them to be used interchangeably.

relates the rate at which businessmen increase their product prices to the rate of rise of wages, to the rate at which prices in general are expected to rise, to excess demand in the product market, and to cost-push forces. The price-expectations equation states that the anticipated future rate of inflation is generated from experienced actual rates of price inflation and perhaps other influences also. Finally, the demand-pressure equation expresses the level of excess aggregate demand as a function of the rate of growth of the real stock of money, the strength of fiscal policy, and the vector of cost-push forces. Taken together, these relations form a simple four-equation system which, given the values of the independent and predetermined (lagged) variables, can be solved for the values of the dependent variables w, p, p^e, and x. These latter variables, being determined within the system, are said to constitute the dependent or *endogenous* variables of the model. By contrast, the fiscal policy, money growth, and cost-push variables are considered *exogenous,* i.e., determined outside the system.

The exogenous variables are treated as the proximate causes or sources of inflation. They correspond to three leading explanations of how inflation gets started, namely, the fiscalist, the monetarist, and the cost-push views. The first two views constitute alternative versions of the so-called demand-pull theory of inflation. Whereas the fiscalist version concentrates on overexpansionary government fiscal policy as the primary source of demand inflation, the monetarist version focuses on the causal role of money growth, arguing that fiscal policy at best exerts only a transitory impact on the rate of inflation. Monetarist theories also tend to omit the cost-push variable as a cause of inflation, although they do acknowledge that cost increases are a vital intermediate link in the transmission mechanism through which inflationary pressures are propagated through the economy. By contrast, cost-push theories stress the inflation-initiating—as distinct from the mere inflation-transmitting—role of the cost-push variable, asserting that it enters the inflationary process both directly to determine wage- and price-setting behavior and indirectly to influence the rate of monetary growth, which is allowed to adjust passively so as to validate the cost inflation generated by unions and firms.

The latter point raises the question of the type of policy regime assumed in the general framework. As formulated above, it assumes an exogenous policy regime, i.e., one in which the authorities conduct their policies to insure that the main line of causation flows from the policy variables directly to the dependent excess demand variable rather than vice versa. As discussed later in the article, however, the framework can be modified to accommodate the reverse-causation assumption of an endogenous policy regime in which the authorities allow the policy variables at least partially to respond to and be determined by changes in excess demand. Thus, with suitable adjustment, the model is capable of handling both types of policy regimes.

Finally, it should be noted that the model contains no equations representing the bond and/or equity markets. Thus it is incapable of explaining the transmission of inflationary pressures through the financial sector of the economy. Instead, it concentrates on the transmission of inflation through the money, labor, and product markets. This shortcoming notwithstanding, the framework is still sufficiently general to accommodate important components of many theories of inflation. Specific theories—or at least parts of specific theories—emerge from the general framework when one suppresses certain variables, emphasizes others, and perhaps drops one or more of the equations. In any case, the four equations may be taken as a basis for outlining the main controversies among current expositors of the phenomenon of inflation.

The Wage Equation The chief controversy relating to the wage equation concerns the determinants of wage-setting behavior. At least four views can be distinguished, namely, (1) the naive Phillips curve hypothesis, (2) the expectations-augmented/excess-demand hypothesis, (3) the pure cost-push hypothesis, and (4) the eclectic view.

The Phillips curve hypothesis states that the rate of money wage increase depends on the excess demand for labor (i.e., $w = w(x)$ where x is measured or proxied by the inverse of the unemployment rate). This theory is incapable of explaining how rapid wage inflation could persist in the face of slack labor markets in which excess demand is zero or negative.

The expectations-augmented/excess-demand hypothesis introduces the price-expectations variable into the Phillips curve and states that the rate of wage increase is determined by excess demand in the labor market and by workers' and employers' anticipations of future price inflation

(i.e., $w = w(x, p^e)$). The logic underlying this formulation is straightforward. Demand pressure x pushes up wages. The greater the pressure the faster will wages rise. Even if demand pressure were absent or negative, however, wages would still exhibit a tendency to rise because workers are primarily concerned with real wages—i.e., with the purchasing power of money wages—and therefore bargain for money wage increases sufficient to protect real wages from anticipated future increases in the cost of living (represented in the equation by p^e, or price expectations). Similarly, employers interested in maintaining their relative position in the labor market must offer wage increases sufficient to match those increases that rival employers are expected to offer. Otherwise they will lose employees, and their relative market share will fall. Thus even in a situation of zero excess demand, employers on the average will be raising wages by the amount they expect wages and prices in general to rise. Nominal wages will rise, but each employer's real wage offer relative to the market average wage will remain unchanged.

Opposed to the expectations/excess-demand hypothesis is the pure cost-push view. More influential in the United Kingdom than in the United States, this theory holds that the rate of wage increase is initiated and determined by the vector of cost-push forces independently of price expectations and the state of excess demand (i.e., $w = w(z)$). Cost-push pressures include such forces as (1) monopoly market power, (2) trade-union militancy, and (3) wage earners' frustration arising from unfulfilled expectations regarding growth of real income and relative income shares. Labor unrest, frustration, and militancy are seen as causes and not—as in the monetarist theory—as consequences of inflation.

The cost-push hypothesis is in the class of theories that attribute inflation to monopoly power, whether wielded by unions or corporations. These theories assert that large organizations, seeking to enlarge their relative shares in the national income, utilize the market power in their possession to push wages and prices upward, thus spearheading and causing new rounds of inflation.

The monopoly power hypothesis has been criticized predominantly, but not solely, by monetarists on both theoretical and empirical grounds. First, critics state that the market power argument is at odds with the orthodox theory of monopoly behavior. According to the orthodox view, a monopolist sets a relative price for his product that maximizes profits in real terms and maintains that real price by adjusting his nominal price to allow for inflation. The logical implication is that, given the degree of monopoly power, monopolists would have no incentive to raise prices other than to catch up or keep pace with general inflation.[2] With real prices already established at profit maximizing levels, any further upward adjustment would only *reduce* profits. On the other hand, if prices are currently being raised to exploit hitherto unexploited monopoly potential, the question naturally arises as to why those gains were foregone or sacrificed in the past. In either case, monetarists argue, rising real prices imply non-rational (i.e., non-profit maximizing) behavior, contrary to the basic axiom of conventional economic theory. True, rising real prices *would* be consistent with profit maximizing behavior if the degree of monopoly power were increasing.[3] But there is little empirical evidence that monopoly power is on the rise.

Responding to this criticism, cost-push theorists state that the monopoly power of labor *is* rising, as evidenced by the spread of unionization to groups not previously organized, e.g., public (government) employees. Also cited are factors such as liberal unemployment benefits and welfare payments that have raised workers' capacity to hold out in long strikes. With regard to the question of rational maximizing behavior, some cost-push advocates maintain that the conventional analysis cannot be applied to unions because the latter, unlike the business firms of traditional theory, do not necessarily maximize income.

To the critics, however, this last point is totally irrelevant. Trade unions, they argue, do not have to be income maximizers for the conventional

---

[2] In support of this contention, critics of cost-push cite empirical studies showing that when big firms do raise their prices they are usually trying to catch up with general inflation. Such catch-up price increases should not be interpreted as inflation-generating price increases. Similarly, when unions raise wages, they are often just trying to catch up with past price increases or protect wages from expected future price increases. They are not necessarily trying to increase their relative income share, which is probably already at its maximum, given the degree of their market power.

[3] The point here is that the mere existence of monopoly power is not enough to produce inflation. The monopoly power must be steadily *increasing*. Monopoly power results in resource misallocation, thus reducing real income and raising the price level relative to what it would be if perfect competition prevailed. But this is an argument for *high*, not *rising*, prices. To produce inflation, i.e., a condition of continually rising prices, monopoly power must be ever-increasing. An existing degree of monopoly power cannot generate a sustained inflation.

analysis to apply. It still holds as long as union leaders attempt to maximize *some* variable—e.g., union membership, hourly wage rates, or the wage bill of a select portion of the union membership. That is, it still holds as long as union behavior results in a determinate equilibrium real wage. What *is* relevant, the critics assert, is the distinction between relative prices and absolute prices, i.e., the general price level. Cost-push theory is alleged to display a fundamental confusion involving the use of relative price concepts to explain the behavior of the absolute price level.

According to the critics of cost-push, market power is not a legitimate explanation of general inflation. Monopoly power determines relative prices, not the general price level or its rate of change. To be sure, the *particular* price of a monopolized product will be higher relative to other prices than it would be if the specific industry were competitive. But except for a slight rise due to resource misallocation, the overall or general level of prices would probably remain substantially unchanged. Likewise specific wage rates obtained by monopolistic unions will be higher in comparison with other wages than would be the case if all labor markets were competitive. Again, however, the overall level of wages need not be affected. In both cases, monopoly power affects the *structure* of wages and prices but not their general *level.* The logic behind this conclusion is straightforward and goes as follows. When a monopolist raises his price he reduces his output and his employment of factor inputs, thereby releasing resources to increase output and lower prices elsewhere in the economy. Similarly, when a monopolistic labor union raises its wage, it causes a diminution of employment in its sector, thereby releasing labor to other sectors where the increased labor supply acts to lower wage rates. In either case, the rise in monopoly prices (or wages) is offset by a compensating reduction in competitive prices (or wages), leaving the average level unchanged. Monopoly power determines relative prices (and hence quantities sold or employed), not absolute prices as claimed by the cost-push hypothesis.

Cost-push theorists rebut this latter criticism by challenging the validity of its underlying assumptions of perfect resource mobility and perfect price flexibility. They correctly point out that if resources are relatively immobile and prices downwardly inflexible, particular price increases can cause generalized inflation, i.e., in this case absolute prices are not independent of relative prices. In a world of sticky prices, inflation could occur for two reasons. First, the general price index, constituting an average of all prices, will necessarily rise purely as a matter of arithmetic when a rise in one of its components is not offset by a fall in the others. Second and more important, rising relative prices may induce additional inflation via the policymakers' reaction to their impact on employment. With a constant level of aggregate expenditure and downwardly rigid prices, particular price increases will generate compensating reductions not in other prices but rather in output and employment. Given society's high employment objectives, the authorities may have no choice but to accommodate the specific price increases with expansionary policies when employment falls below its target level. Thus the political constraints imposed by the commitment to high employment may enter directly into the process by which particular cost increases are transformed into generalized inflationary pressures.

In some quarters this explanation has been dismissed on grounds that it has been falsified by experience, which shows that high levels of unemployment, while much deplored, have nevertheless been tolerated for long periods. But many analysts accept the explanation as valid, and the debate between the cost-push theorists and their critics continues. There is, however, an eclectic view of wage-setting behavior that lies between the extremes of the pure cost-push and excess-demand views and incorporates elements of both. According to this third view, wages are pulled up by excess demand, pushed up by cost-push forces, and rise in response to increases in the cost of living, actual and anticipated. In equation form this eclectic view can be expressed as $w = w(p, p^e, x, z)$.

The Price Equation Regarding the price equation, four issues have dominated recent discussion. The first concerns the proper specification of the independent variables in the equation. What are the dominant determinants of price-setting behavior? There is unanimous agreement that the rate of wage inflation affects the rate of price increase. But there is much less agreement

about whether excess demand plays a direct role in price determination. Both the Phillips curve and expectations-augmented/excess-demand theories contend that it does, while the cost-push hypothesis claims it does not.

This latter point, incidentally, explains why cost-push theorists advocate incomes policies and direct controls as anti-inflation weapons. For if the rate of inflation is determined not by excess demand but rather by cost-push forces operating through wages and profit markups, then it follows that inflation will be immune to traditional restrictive demand-management policies. In such cases it may be necessary to employ incomes policies to influence the underlying cost-push forces and to use controls to directly constrain rates of wage and price increase.

Aside from the cost-push view, the other main theory of price-setting behavior that denies excess demand a direct price-determining role is the so-called normal-cost hypothesis. This theory states that prices are determined by applying fixed percentage markups to unit production costs at normal (standard) levels of capacity utilization, with the markups set to yield target rates of return on equity. This hypothesis focuses on the rate of wage increase that constitutes the dominant component of changes in unit costs upon which price changes depend. Note, however, that the normal-cost hypothesis is not incompatible with the notion that prices respond, with a lag, to excess demand, since that variable can influence prices indirectly through the labor markets. The price equation in this case can be expressed either as $p = p(w)$ or $p = p(x_L)$ where the time-lag L represents the time it takes for demand pressure to influence product prices through the channel of factor costs.

The second issue is whether a long-run inflation-output (or inflation-unemployment) trade off exists, thereby permitting the authorities to peg the unemployment rate at any desired level without risking persistent acceleration of the rate of inflation. The standard Phillips curve hypothesis implied the affirmative. But the notion of a permanent trade off was severely challenged by the so-called accelerationist school. Using an expectations-augmented/excess-demand version of the Phillips curve price equation, this school demonstrated that the trade off is only temporary, that it depends upon people being fooled by unanticipated inflation (i.e., the difference between actual and expected inflation $p - p^e$), and that it vanishes in the long run when price expectations fully adjust to price experience and are completely incorporated in wage- and price-setting behavior. Accelerationists argued that inflation stimulates economic activity only if it is unanticipated. An unexpected inflation induces producers, who are pleasantly surprised to find their product prices rising faster and their real (price-deflated) costs rising slower than expected, to expand output and employment. But the stimulative effects eventually disappear when the inflation becomes fully anticipated. This conclusion can be expressed symbolically by rearranging the accelerationist price equation $p = ax + p^e$ to read $p - p^e = ax$, where the coefficient a expresses the numerical magnitude of the trade off between the variables on the left- and right-hand sides of the equation. So written, the equation states that the trade off is between unanticipated inflation $p - p^e$ and output (as represented by real excess demand x) and that it vanishes when inflation is fully anticipated and adjusted for, i.e., when $p - p^e = \text{zero}$.[4]

A separate but closely related issue is whether even an indefinitely accelerating inflation is sufficient to provide a permanent stimulus to real activity. Some accelerationist models that deny the existence of a long-run trade off between output and the rate of inflation itself nevertheless imply that, if price expectations are formed in a certain way, there will be a stable trade off between output and the *rate of acceleration* of the inflation rate (Δp). In other words, while expectations would eventually adapt completely to any stable rate of inflation, thereby negating the trade off, those expectations would consistently lag behind a constantly accelerating rate. A policy of inflating the price level at a faster and faster pace can thus permanently fool all the people all the time and peg the economy at any

[4] The no-trade-off view implies that the price-expectations variable enters the price equation with a coefficient of unity. To show this let the price equation be $p = ax + \Phi p^e$ where Φ is the coefficient attached to p^e. Long-run equilibrium is characterized by equality between actual and anticipated rates of inflation, reflecting the tendency of price expectations to be correctly formed in the long run. Setting $p^e = p$ in the equation as required for long-run equilibrium and solving for p yields the expression $p = [a/(1-\Phi)]x$. If the coefficient Φ is a fraction, adjustment to fully-anticipated inflation is incomplete, and a stable long-run trade off exists between p and x. But if the coefficient Φ is unity, implying complete adjustment to anticipated inflation, the bracketed term is undefined and the trade off vanishes.

desired level of output and employment.[5] As other economists have pointed out, however, it is unlikely that such a policy could fool the people forever. Eventually they would anticipate the rate of acceleration itself and adapt to it. The policymakers would then have to go to still higher derivatives or orders of rates of price change ($\Delta^2 p$, $\Delta^3 p$, . . . $\Delta^n p$) to stimulate the economy, and these higher derivatives, too, would eventually come to be anticipated.

It should be stressed, however, that many analysts remain skeptical of arguments denying the existence of permanent trade offs involving inflation and its derivatives. These skeptics point to the stringent assumptions underlying the no-trade-off view. Not only must price expectations be correct and unanimously held, but those anticipations must be completely incorporated in all contracts to preserve the equilibrium structure of relative prices and real incomes. Skeptics argue that even if the first condition were satisfied—a heroic assumption—the second probably would be violated. For one thing, certain passive income groups—e.g., rentiers and pensioners—may be powerless to act on their price forecasts. Other groups that possess the power to adjust their nominal incomes for fully anticipated inflation may choose not to do so. An example would be where workers are more concerned about their relative (comparative) wages vis-a-vis each other than about the absolute level of real wages. These workers would be willing to accept inflation-induced reductions in real wages as long as other wages were similarly affected and relative wage relationships remained unaltered. Whether such hypothetical situations of incomplete adjustment under conditions of rational behavior do in fact actually occur, however, is an open question, and the controversy over the existence of long-run trade offs remains unresolved.

A fourth issue is concerned with the causes of price rigidity or, more precisely, with explaining why prices tend to respond so slowly to shifts in demand. Interest in this topic has been greatly stimulated by the recent experience with inflationary recession or stagflation in which prices continued to rise long after excess demand had disappeared.

The traditional or classical model of price dynamics is of no help in explaining why inflation persists despite slack markets and high unemployment. According to the traditional model, prices adjust swiftly in response to excess demand or supply so as to clear the market. Nor is the Phillips curve model that expresses the rate of price change as a function of excess demand useful in interpreting stagflation. This model predicts that the rate of price change is zero when excess demand is eliminated and that price *de*flation accompanies excess supply. Neither model is consistent with experience showing that positive rates of price change can coexist with zero or negative excess demand for protracted periods of time. Apparently, many markets lack the short-run excess-demand price-adjustment mechanisms postulated by the classical and Phillips curve theories. What accounts for the actual slow-working price mechanism and for the consequent persistence of inflation even in the face of slack demand and high unemployment? At least three explanations have been offered.

In the expectations-augmented/excess-demand model, prices can continue to rise even when excess demand is zero or negative as long as inflationary expectations are sufficiently strong. Stagflation is explained in terms of sticky price anticipations. Specifically, the model states that price expectations are based on past price experience. And if that experience has been one of inflation, price anticipations can continue to mount, putting upward pressure on prices even when aggregate demand is falling. With price anticipations still adapting to the inflationary past, the response of actual inflation to a reduction in aggregate demand will be agonizingly slow.

A second explanation attributes sluggish price adjustment to the prevalence of long-term contractual arrangements that fix prices for substantial intervals of time. Such contractual rigidities are said to distinguish so-called customer markets from spot-auction markets where flexible prices operate to keep the market continuously cleared. In customer markets, high search costs (time, effort, inconvenience, etc.) of comparison shopping give buyers an incentive to continue trading with customary sellers whose offers have proven satisfactory in the past. The customers of course

[5] An example will demonstrate. Let the price equation be $p = ax + p^e$ where the unit coefficient attached to p^e implies the absence of a long-run trade off between p and x. From this equation it follows that the relationship among the rates of change of the variables p, x, and p^e is given by the expression $\dot{p} = a\dot{x} + \dot{p}^e$ where the dots indicate rates of change (time derivatives) of the variables. Now assume that people are continuously revising their price expectations by some fraction b of the forecasting error between actual and predicted rates of inflation $p - p^e$. This expectations-generating mechanism is written as $\dot{p}^e = b(p-p^e)$ where $\dot{p}^e$ is the rate of change of price expectations. Substituting this latter equation into the one immediately preceding it and simplifying yields $\dot{p} = a\dot{x} + abx$. Finally, if excess demand is unchanging so that $\dot{x} =$ zero—as would be the case if the authorities were pegging x at some desired level—this last equation reduces to $\dot{p} = abx$, showing a trade-off relation between the rate of change of the rate of inflation $\dot{p}$ and excess demand x.

must believe that the terms of the offers will remain unchanged, otherwise it might pay them to desert regular suppliers and shop elsewhere. The sellers themselves have an incentive to maintain stable prices in order to retain their established clientele. Since higher prices would encourage customers to shop elsewhere, sellers avoid or delay changing prices in response to short-run shifts in demand.

In effect, sellers implicitly agree to maintain their price offers in return for buyers' implicit promises of continued patronage. The agreement remains implicit because of the high legal costs of negotiating and spelling out an explicit formal written contract. Like all unwritten agreements, however, these implicit contracts only work if both parties assent to certain rules of fair play. In the case of customer markets the typical standard of fair play involves setting prices on the basis of long-run unit costs. Buyers are willing to accept price increases induced by permanent shifts in unit costs. Sellers in turn agree to absorb temporary cost increases just as they agree to ignore short-run shifts in demand when setting their prices. Thus prices remain unresponsive to short-run shifts in demand and costs.

A third explanation of sluggish price adjustment stresses producer interdependence and the need for price coordination. This view states that in many industries there is much uncertainty concerning the market-clearing price. Given this uncertainty, firms endeavor to avoid the market disruption, confusion, and perhaps even outright price warfare that could result if each sought individually to determine the equilibrium price. In order to prevent such confusion from developing, firms seek ways to coordinate price changes. Such coordination, if successful, will assure that firms raise prices in unison and that price changes will not occur when demand shifts are thought to be temporary and reversible. The preferred method of facilitating coordination is to base price changes on changes in standard unit labor and material costs, which tend to be the same for all firms in the industry. This cost-based pricing behavior assures that prices will respond only to costs, not to demand—although demand pressure may of course affect prices indirectly through the factor markets. It also assures that price changes will be uniform throughout the industry thereby minimizing the risk of competitive price undercutting.

The Price-Expectations Equation The preceding sections have concentrated on alternative views of wage- and price-setting behavior. As previously noted, many of these explanations stress the role of expectations of future price inflation as a key determinant of rates of actual wage and price increase. In view of the central importance attached to price expectations, it is not surprising that much recent attention has focused on the mechanism by which those expectations are generated and revised. Concerning the formation of expectations, at least three hypotheses have emerged.

The first sees price expectations as determined by essentially unexplainable psychological forces. This view interprets the anticipated rate of inflation as a volatile, unstable variable subject to sudden and frequent shifts due to changes in subjective non-economic factors that cannot be systematically explained within the framework of a macroeconomic model.

The second hypothesis, in sharp contrast with the first, states that price expectations are systematically determined by objective economic data, namely, actual rates of inflation experienced in the past. Known as the *adaptive-expectations* or *error-learning* hypothesis, this theory postulates that individuals form expectations of future rates of inflation from a geometrically weighted average of experienced past rates of inflation and then periodically revise those expectations if actual inflation turns out to be different than expected. In econometric studies of the inflationary process the adaptive-expectations model constitutes the most prevalent explanation of how price expectations are generated.

Despite its widespread use, many economists are dissatisfied with the adaptive-expectations hypothesis. They think it is an unrealistic and inaccurate description of how price anticipations are formed. Expectations, they claim, are as likely to be generated from direct forecasts of the future as from mere projections of the past. Moreover, people probably base their anticipations at least as much on current information about a variety of developments — e.g., money stock growth rates, imminent changes in political administration—as on data pertaining solely to past price changes. In short, one would expect rational individuals to utilize *all* the relevant information to improve the accuracy of their price forecasts. Yet the adaptive-expectations hypothesis holds that people look at only a small subset of the relevant information—namely, past price

changes—in forming expectations. This does not appear to be consistent with rational forecasting behavior.

Disenchantment with the adaptive-expectations model has stimulated a search for an alternative explanation of the expectations-generating mechanism. This search has culminated in the formulation of the so-called *rational-expectations* hypothesis, which constitutes the third view of expectations formation as mentioned above.

According to the rational-expectations hypothesis, individuals will tend to exploit *all* the pertinent information about the inflationary process when making their price forecasts. If true, this means that forecasting errors ultimately could arise only from random (unforeseen) shocks occurring to the economy. At first, of course, forecasting errors could also arise because individuals initially possess limited or incomplete information about the inflationary mechanism. But it is unlikely that this latter condition would persist. For if the public is truly rational, it will quickly learn from these inflationary surprises and incorporate the new information into its forecasting procedures, i.e., the sources of forecasting mistakes will be swiftly perceived and systematically eradicated. As knowledge of the inflationary process improves, forecasting models will be continually revised to produce more accurate predictions. Eventually all systematic (predictable) elements influencing the rate of inflation will become known and fully understood, and individuals' price expectations will constitute the most accurate (unbiased) forecast consistent with that knowledge.[6] As incorporated in monetarist models, the rational-expectations hypothesis implies that thereafter, except for unavoidable surprises due to purely random shocks, price expectations will always be correct and the economy will always be at its long-run steady-state equilibrium.[7]

Monetarist advocates of the strict rational-expectations view argue that it carries some radical implications for stabilization policy. Specifically it implies that systematic policy actions—e.g., those based on feedback control rules—cannot influence real variables even in the short run, since rational agents would already have anticipated and acted upon those policies. To have an impact on output and employment the authorities must be able to create a divergence between actual and expected inflation. This follows from the monetarist view that inflation influences real variables only when it is unanticipated. The authorities must be able to alter the actual rate of inflation without simultaneously causing an identical change in the expected future rate. This may be impossible if the public can predict policy actions. Systematic policy actions are of course predictable policy actions. Stable policy response functions can be estimated and incorporated into the information used by forecasters. Rational agents, that is, can use past observations on the behavior of the authorities to predict future policy moves. Then, on the basis of these predictions, agents can correct for the policies beforehand by making appropriate adjustments to all nominal wages and prices. Consequently, when stabilization actions do occur, they will have no impact on real variables since they will have been discounted and neutralized in advance. The only conceivable way that policy can have even a short-run influence on real variables is for it to be completely unexpected, i.e., the policymakers must act in an unpredictable random fashion. But random behavior hardly seems a proper basis for public policy.

Monetarist proponents of rational expectations use reasoning similar to the above to deny the effectiveness of discretionary stabilization policy. But advocates of countercyclical discretionary policy argue that such extreme conclusions are unwarranted. They point out that the strict rational-expectations hypothesis, despite its seemingly powerful logic, does not stand up well against the facts. According to this group, policy actions have pronounced and protracted short-run effects on real variables, the economy is rarely at or even near its long-run steady-state equilibrium path, forecasting remains an extremely hazardous and surprise-ridden business,

---

[6] Specifically, the rational expectations hypothesis states that when expectations are formed rationally, the anticipated rate of inflation formed at the end of the preceding period p^e_{-1} is an unbiased predictor of the actual rate of inflation p, given all the information I_{-1} available at the end of the preceding period. That is, the expected value of p, given the information I_{-1}, is p^e_{-1}. In equation form, $p^e_{-1} = E(p|I_{-1})$ where E is the expectations operator. This latter formulation implies that the actual rate of inflation can differ from the expected rate only by a random forecasting error ϵ, i.e., $p - p^e_{-1} = p - E(p|I_{-1}) = \epsilon$. The forecasting error ϵ is of course statistically independent of all information known as of the end of the preceding period, since all statistical correlations between ϵ and I already would have been incorporated into the latter variable.

[7] In deterministic non-stochastic models of the type employed in this article, random shocks are ruled out. Therefore, in terms of the model, the rational-expectations hypothesis implies that the economy is perpetually in steady-state equilibrium.

and the rate of inflation responds sluggishly to restrictive policy. Something must be wrong with the strict rational-expectations view.

To critics, this view suffers from two main flaws. First, in common with all monetarist models, the rational-expectations hypothesis implies that transitory output effects can only arise from expectational errors, i.e., discrepancies between actual and expected rates of price change. In a rational non-stochastic world such errors never occur since expectations are always correct. Second, the rational-expectations hypothesis implies perfect price flexibility. This follows from the view that actual prices never deviate from expected prices, i.e., the current rate of inflation always adjusts completely and instantaneously to changes in the expected rate, so that steady-state equilibrium always prevails.

Both implications, critics hold, strain credulity. Far from being perfectly flexible, prices are actually sticky and respond slowly—as indicated by the persistence of stubborn inflation. Moreover, the long price-adjustment lags and the corresponding protracted output and employment effects observed in practice cannot be explained solely in terms of expectational surprises. Price setters just do not take that long to react to purely expectational errors. Long price delays and the associated quantity effects can only arise from contractual and institutional rigidities that prevent economic agents from adjusting to inflation even when it is correctly anticipated. Critics argue that once such contractual rigidities are taken into account, the strict version of the rational-expectations hypothesis ceases to hold. Instead, the forecasting procedure best suited to such cases may well be one that approximates the adaptive-expectations model.[8]

The Demand-Pressure Equation The demand-pressure equation completes the model of the inflationary process. It does so by specifying the proximate determinants of the excess demand variable that interacts with other variables in the wage and price equations to determine the rate of inflation. Debates pertaining to the demand-pressure equation center on two issues.

The first issue involves the question of the relative importance of the three main independent variables in the equation: the rate of money stock growth, fiscal policy, and cost-push forces. Of these three variables, which exercises the major influence on demand pressure? Not surprisingly, the answer often depends upon whether the analyst is a nonmonetarist, a monetarist, or an advocate of the cost-push view. Moreover, within the monetarist camp the answer may differ depending upon whether one is an adaptive-expectations monetarist or a rational-expectations monetarist.

Many nonmonetarists would state that fiscal and monetary policy variables are of equal importance. Other nonmonetarists, while agreeing that monetary policy is important, would nevertheless rank it behind fiscal policy. Monetarists, on the other hand, would concentrate almost exclusively on the money growth variable and treat the fiscal variable as having negligible importance. True, they might grudgingly admit that fiscal policy could have a temporary impact on excess demand. But they would emphasize that any fiscal effects would be short-lived before vanishing altogether.

Although monetarists are unanimous in deemphasizing the impact of fiscal policy, they tend to differ on the question of the influence of monetary growth on excess demand. Members of the adaptive-expectations branch believe that changes in the rate of monetary growth can generate temporary changes in real excess demand as long as expectations are unfulfilled. On the other hand, monetarists of the rational-expectations branch deny that monetary growth can influence real excess demand even temporarily. If expectations are formed rationally, the economy is always—except for random disturbances— at its steady-state equilibrium. And if steady-state equilibrium always prevails, it follows that shifts in the rate of monetary growth influence only nominal variables (e.g., the rate of inflation) but not real variables like excess demand. With expectations adjusting completely and instantaneously to actual outcomes, inflationary surprises are absent, and rational agents are never fooled into producing excess (i.e., greater than equilibrium) output.

[8] The strict rational-expectations hypothesis departs from reality in still another way. It assumes that all relevant information is freely available so that forecasting accuracy can be perfected at zero marginal cost. In actuality, however, the cost of acquiring and processing additional information may be quite high relative to benefits—think of the cost of computer time. Confronted with high information costs, economically rational agents might well forego the pure rational-expectations approach in favor of cruder but less costly forecasting techniques, e.g., the adaptive-expectations model.

While monetarists may disagree about the influence of monetary growth on real excess demand, they do agree that cost-push factors should not enter the demand-pressure equation. On this point they are in direct opposition to cost-push theorists, who hold that such forces play a major role in the determination of excess demand. The latter group argues that not only does the cost-push variable directly enter the demand-pressure equation with a negative sign, but that it also affects excess demand indirectly through the rate of inflation. With monetary growth held constant, cost-push pressure on prices will act to reduce real purchasing power, thereby causing real spending to fall. Thus, assuming constant monetary growth, the operation of cost-push forces causes excess demand to become negative and unemployment to rise.

It is evident from the preceding discussion that cost-push theorists also believe that the monetary growth variable plays an important role in the determination of excess demand. In fact, this belief constitutes the basis for their advocacy of accommodative monetary policy. Passive monetary growth is necessary to offset or counteract the contractionary influence of cost-push forces. On the other hand, an activist anti-inflationary monetary policy is definitely harmful. Not only is it incapable of controlling cost inflation, but it also intensifies the unemployment problem generated by cost-push forces. Cost inflation should be restrained by direct controls, not by demand-management policies.

A second debate concerns the process by which two of the determinants of excess demand—namely the monetary and fiscal variables—themselves are determined. On this latter question two issues are especially relevant. First, should the policy instruments be viewed as determined outside or inside the system? Second, are the policy instruments independent of each other?

Regarding the former issue, there are two views. One asserts that the policy instruments should be treated as exogenous variables whose magnitudes are fixed outside the model of the inflationary process. Advocates of this view believe that the main line of causation or channel of influence runs from the policy instruments to excess demand and prices rather than vice versa. The policy instruments can be treated not as dependent or accommodative variables responding to prior changes in demand but rather as the active independent variables that precede and cause shifts in demand. The alternative view is that the policy instruments should be treated as endogenous variables determined within the system by the policymakers' responses to changes in economic conditions. Advocates of this view see causation as running at least partially from aggregate demand and inflation to the policy variables. They argue that models of the inflationary process should contain additional equations—so-called policy reaction functions—describing how the authorities change the settings of the monetary and fiscal instruments in response to fluctuations in aggregate demand and the rate of inflation. An example of such a policy response function would be where the authorities pursue a target level of excess demand, seeking monetary growth and budgetary deficits consistent with the attainment of the target. In this case the target level of excess demand would enter the system as a datum to determine the values of the monetary and fiscal instruments, and the policy regime would be described by the equations $m = m(x)$ and $f = f(x)$.

In addition to the exogeneity-endogeneity issue, there is also the question of the independence of the policy instruments. Are the monetary and fiscal variables truly independent of each other or do they move together? This question is central to the debate over the causes of inflation. For if the instruments are in fact interrelated so that fiscal deficits are accompanied by accelerating monetary growth, it is virtually impossible to identify which is the unique source of inflation. Monetarists and nonmonetarists can cite the same evidence to support their respective views.

Many analysts believe that the policy instruments are not independent but instead are interrelated through the so-called government budget constraint. This constraint states the mathematical identity between the government's budget deficit and the means of financing it. Specifically, the budget constraint states that the deficit $G - T$—i.e., the gap between government expenditures G and taxes T—must be financed by an increase in government debt ΔD and/or by an increase in the monetary base ΔB consisting of currency and bank reserves created by the central bank. In short, a fiscal deficit $G - T$ must be financed by debt issuance ΔD and money creation ΔB as expressed by the budget constraint identity $G - T = \Delta D + \Delta B$.

In principle, budget deficits G — T could be financed entirely by new debt issues ΔD, provided interest rates were allowed to rise to sufficiently high levels. In practice, however, concern with the potentially disrupting effects of sharply rising interest rates insures that this drastic route is rarely taken. Instead, fiscal deficits are usually accommodated at least partially by money stock growth. Thus, the variables G — T and ΔB tend to move together, making it difficult to identify which, if either, is the unique cause of inflation.

Summary and Conclusions This article has examined within a simple aggregative framework some of the major current controversies in the theory of inflation. On the basis of alternative positions taken in these debates, at least four distinct theories can be identified. They are summarized as follows.

1. ADAPTIVE-EXPECTATIONS MONETARISM. This theory states that inflation is determined by excess aggregate demand and price expectations; that expectations are generated by past price history and hence by previous excess demand; that excess demand results from excessive monetary growth; and therefore that excessive monetary growth, past and present, is the root cause of inflation. Only monetary growth matters; cost-push factors are totally ignored, and fiscal stimuli are largely dismissed on the grounds that they have no lasting impact on inflation. Inflation-unemployment trade offs are seen as existing in the short- but not the long-run. That is, changes in monetary growth, by causing divergences between actual and expected rates of inflation, can generate large and protracted transitory changes in excess demand and associated real variables. In the long run, however, expectations will be fulfilled, excess demand will be zero, and monetary growth will influence only the rate of inflation. Monetary growth cannot affect real variables in steady-state equilibrium.

2. RATIONAL-EXPECTATIONS MONETARISM. This version of monetarism predicts that, in the absence of unpredictable random disturbances, steady-state equilibrium always prevails. Monetary changes produce no surprises, no disappointed expectations, no transitory impacts on real variables. Trade offs are impossible even in the short run. This theory is hard to square with such phenomena as stagflation, the apparent intractability of the inflation rate, and the short-run nonneutrality of money.

3. PURE COST-PUSH THEORY. More popular in Britain than in the U.S., this theory postulates that wage and price increases are determined solely by non-economic, socio-political cost-push forces independent of general economic conditions. Inflation is explained by the introduction of the cost-push variable in the wage and price equations. All other determinants are dispensed with. Thus monetary growth is denied a direct inflation-determining role, its only function being to passively accommodate push-induced cost increases in order to maintain output and employment at high levels.

4. ORTHODOX NONMONETARISM. Included in this category are a variety of models that may differ with regard to such features as long-run inflation-unemployment trade-off properties, relative weight given to monetary vs. fiscal influences, and the like. Whatever their individual differences, however, nonmonetarist models as a class have the following distinguishing characteristic. They permit all three exogenous variables — monetary growth, fiscal policy, push factors—to influence excess demand and the rate of inflation. Moreover, orthodox nonmonetarism shares with adaptive-expectations monetarism the view that policy actions will affect output and employment first and prices only later, often with very long lags. But whereas monetarists attribute these phenomena solely to price surprises (disappointed expectations) and lags in the revision of expectations, nonmonetarists believe that institutional and contractual rigidities are also to blame.

Of these four theories, two appear untenable when judged against the criteria of plausibility, realism, and relevance. These two, of course, are rational-expectations monetarism and the pure cost-push view. The former, as previously stated, conflicts with the observed tendency for quantities to bear the burden of adjustment to monetary changes, while prices respond very slowly and with long lags. The cost-push theory, on the other hand, implies a degree of trade-union market power and full-employment-at-any-cost policy that has never existed in the United States.

This leaves only adaptive-expectations monetarism and orthodox nonmonetarism as serious contenders for the distinction of constituting the most plausible theory of inflation. Both are capable of accounting for the phenomenon of stagflation, for the intractability or resistance of inflation to anti-inflationary demand-management policies, and for the tendency of quantities rather than prices to adjust to shifts in demand. Of the two, the nonmonetarist view seems to be the more convincing since it explains sluggish price adjustment in terms of contractual and institutional, as well as expectational, rigidities. In any case, if and when a new consensus view of inflation finally emerges, it will probably contain elements of both the monetarist and nonmonetarist explanations.

References

The concepts and issues discussed in the text are more fully developed in the following sources.

Cagan, Phillip. *The Hydra-Headed Monster: The Problem of Inflation in the United States,* Washington, D. C.: American Enterprise Institute for Public Policy Research, 1974. Perhaps the best and most judicious survey of the present state of knowledge regarding inflation. Stresses the need-for-coordination explanation of sluggish price adjustment and shows hat cost-oriented price-setting "practices are not inconsistent with demand-pull theories of inflation.

Friedman, Milton. "Comments." *Guidelines, Informal Controls and the Market Place.* Edited by G. P. Schultz and R. Z. Aliber. Chicago: University of Chicago Press, 1966, pp. 55-61. A leading monetarist's critique of monopoly power theories of inflation. Argues that such theories imply irrational non-profit maximizing behavior.

Gordon, Robert J. "Recent Developments in the Theory of Inflation and Unemployment,,' Northwestern University Center for Mathematical Studies in Economics and Management Science Discussion Paper No. 199, December 1975. (Mimeographed.) Contains a critical evaluation of the rational-expectations hypothesis and its application to economic policy. Also discusses markup pricing models and contractual-rigidity theories of sluggish price behavior.

Gray, Malcolm and Michael Parkin. "Discriminating Between Alternative Explanations of Inflation." University of Manchester- Inflation Workshop Discussion Paper No. 7414, December 1974. (Mimeographed.) The source of the four-equation classificatory framework used in the text. Gray and Parkin employ the four-equation schema to distinguish among monetarist, Keynesian, and cost-push models of inflation. They also show how alternative theories of inflation can be treated as particular special cases of the general framework.

Haberler, Gottfried. "Thoughts on Inflation : The Basic *Business Economics,* 10 (January 1975), 12-18. Comments on the monetarist critique of cost-push theories. Argues that the monopoly power of trade unions has been increasing, thereby putting upward pressure on wages and prices.

Humphrey, Thomas M. "The Persistence of Inflation." *1975 Annual Report.* Richmond: Federal Reserve Bank of Richmond. Discusses factors contributing to sluggish price adjustment and describes the adaptive-expectations *or-* error-learning mechanism used to explain the generation of inflationary anticipations.

Institute of Economic Affairs. *Inflation: Causes, Consequences, Cures; Discourses on the debate* between *the monetary and trade union interpretations.* London: The Institute of Economic Affairs. 1975. Entertaining and instructive debate between proponents and opponents of monopoly power theories of inflation. Peter Jay attempts to defend the monopoly power theory against the attacks of monetarists David Laidler and Milton Friedman. In the course of the debate all the relevant points, pro and con, are raised.

Johnson, Harry G. *Inflation and the Monetarist Controversy.* Amsterdam : North-Holland Publishing Company, 1972. Chapters 1 and 2 contain a relentless monetarist critique of cost-push theories. On page 12 Johnson argues that monopoly power explanations of inflation conflict with the conventional economic theory of profit maximizing behavior.

Laidler. David and Michael Parkin. "Inflation : A Survey.,, *Economic Journal,* 85 (December 1975)) 741-809. An exhaustive survey of the literature on wage- and price-setting behavior, the formation of price expectations, and the determinants of excess aggregate demand. Presents a general model similar to the classificatory framework used in the text and then develops a simple monetarist model as a particular special case of the general model.

Okun, Arthur M. "Inflation: Its Mechanics and Welfare Costs.,' *Brookings Papers on Economic Activity,* 6 (1975, No. 2)) 351-90. The most complete version of the contractual-rigidity explanation of sticky wages and prices.

Parkin, Michael. "The Causes of Inflation: Recent Contributions and Current Controversies.,' *Current Economic Problems.* Edited by M. Parkin and A. R. Cambridge : Cambridge University Press, 1975. Surveys the main debates regarding wage- and price-setting behavior. the generation of inflationary expectations, and the determinants of excess demand. Reports on empirical as well as theoretical findings.

Sargent, Thomas J. and Neil Wallace. "Rational Expectations and the Theory of Economic Policy." *Studies in Monetary Economics,* No. 2. Minneapolis: Federal Reserve Bank of Minneapolis, June 1975. A clear and concise nontechnical exposition of the rational-expectations hypothesis by two of its chief adherents.

Tobin, James. "The Wage-Price Mechanism : Overview of the Conference." *The Econometrics of Price Determination.* Conference sponsored by Board of Governors of the Federal Reserve System and Social Science Research Council. Washington, D. C., October 30-31, 1970. Presents a general inflation model similar to the classificatory framework used in the text. Shows how alternative theories can be treated as particular special cases of the general model. Describes the logic of the accelerationist approach and summarizes some controversies associated with the wage, price, and price-expectations equations.

Trevithick, James A. and Charles Mulvey. *The Economics of Inflation.* New York: John Wiley and Sons, 1975. An excellent textbook survey of the theory of inflation. The expectations-augmented / excess-demand hypothesis is explained with great clarity in Chapter 7. See also Chapter 5, which describes alternative versions of the wage and price equations and Chapter 6, which deals with the role of trade unions and collective bargaining in the inflationary process.