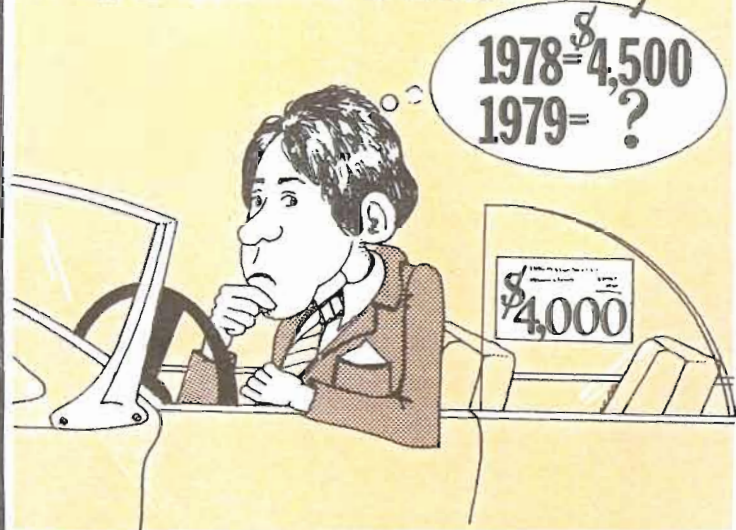


BUSINESS REVIEW

Federal Reserve Bank of Philadelphia

JULY • AUGUST 1977

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Also:
The Mortgage Market:
A Place For Ceilings?
and
The Fed in Print

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INFLATION EXPECTATIONS IN THE U.S.: A BRIEF ANATOMY

Donald J. Mullineaux

... Inflation is costly enough, but people's expectations and uncertainties about inflation may do even more damage to the economy. The author surveys the last 30 years.

THE MORTGAGE MARKET: A PLACE FOR CEILINGS?

Helen Frame Peters

... If the aim is to protect the little guy, imposing interest ceilings won't work in most conventional mortgage markets, though it might be useful where there's FHA or VA backing.

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Inflation Expectations In The U. S.: A Brief Anatomy

by Donald J. Mullineaux*

Those who cannot remember the past are condemned to repeat it.—George Santayana.

Were Santayana an economist, he might have said: those who do not predict the future are destined to forfeit it. Indeed, a host of economic decisions—such as what job to take, what stocks to buy, what school courses to attend, and so on—depend on our expectations of what lies ahead. For all of us, forecasting is inescapable. And it's only necessary to consider the stock market to recognize that those who make the best forecasts usually earn the biggest rewards. Though attempts to divine the future are a fact of life, economists typically have found it difficult to account for the role they play.

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Partly, this reflects the fact that expectations are hard to measure. One way to find out what people are forecasting for the inflation rate and the stock market, for example, is to ask them. But since surveys are costly ventures, few individuals or agencies have seen fit to conduct systematic inquiries of peoples' expectations. One exception is Joseph A. Livingston, a journalist with the *Philadelphia Inquirer*. His findings have been employed by several economists in their attempts to measure inflation expectations.

The measurement problem is not the only reason why economists have foundered on the shoals of expectations. Another is the somewhat curious view that economic analysis has little to say about how people forecast. Keynes, for example, avers that: "Most, probably, of our actions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits—of a spontaneous urge to action rather than in-

action, . . . Only a little more than an expedition to the South Pole, is it based on an exact calculation of benefits to come."¹ Faced with the prospect of explaining and measuring changes in animal spirits, many economists opted for finesse as a strategy for dealing with expectations. (In scientific parlance, to finesse an issue is to shadowbox with it rather than tackle it head on.)

Recently, economists have begun to bring inflation expectations out of the closet and into the mainstream of their analysis of overall economic behavior. The key to this renaissance is a simple idea: that in generating expectations of important economic concerns such as inflation, forecasters are likely to consider the factors that determine actual inflation. This innocuous looking assumption has spawned an enormous amount of research in recent years under the label of the *rational expectations* approach to forecasting. One of the more interesting and controversial findings in these inquiries is the suggestion that governments cannot conduct successful stabilization policies if people form inflation expectations rationally.² Hence, it is important to determine whether people do forecast rationally, and the Livingston survey results can be used to conduct a test.

There is yet another question that can be addressed with the help of the Livingston data: how much uncertainty surrounds the inflation outlook? This is a much underrated issue that analysts and policymakers

alike have tended to gloss over. Yet uncertainty may turn out to be the most costly aspect of our current bout with inflation, as well as the most difficult one to subdue.

LIVINGSTON'S DATA ON PRICE EXPECTATIONS

Since 1947, Livingston has conducted a semiannual survey of about 50 economists in the business and academic worlds. He asks these presumably knowledgeable observers of the state of the U. S. economy to forecast a number of key economic variables, including the level of the consumer price index (CPI). Livingston publishes the results of his survey every six months.

Recognizing that Livingston's long history of survey data might prove useful as measures of inflation expectations, some economists began to employ his results in studies of the way expected inflation is related to interest rates as well as to wage behavior.³ But, using the published results of the Livingston surveys to calculate an expected rate of inflation turns out to be a rather tricky process. In particular, one must be careful in specifying: (1) the time horizon over which forecasters are predicting the CPI and (2) the most recent information available on the actual level of the CPI when the forecast is made. These bits of information are crucial because if researchers identify either of them incorrectly, they will err in calculating the expected rate of inflation. In a thorough study, John Carlson recently analyzed the procedures utilized by these early researchers with the Livingston data.⁴ He concluded that their approach had some shortcomings.

¹John Maynard Keynes, *The General Theory of Employment, Interest and Money* (New York: Harcourt, Brace and Company, 1936), pp. 161-162. It should be noted that Keynes distinguished between short-term and long-term expectations, emphasizing that it was the latter category which was principally subject to the affects of "animal spirits" and other psychological factors. See Chapter 5 for further discussion.

²See Donald J. Mullineaux, "Money Growth, Jobs, and Expectations: Does a Little Learning Ruin Everything?" *Business Review*, Federal Reserve Bank of Philadelphia (November/December 1976) for a discussion of the issues.

³For examples, see William E. Gibson, "Interest Rates and Inflationary Expectations: New Evidence," *American Economic Review* 62 (1972), pp. 854-865 and Stephen J. Turnovsky and Michael L. Wachter, "A Test of the Expectations Hypothesis Using Directly Observed Wage and Price Expectations," *Review of Economics and Statistics* 54 (1972), pp 47-54.

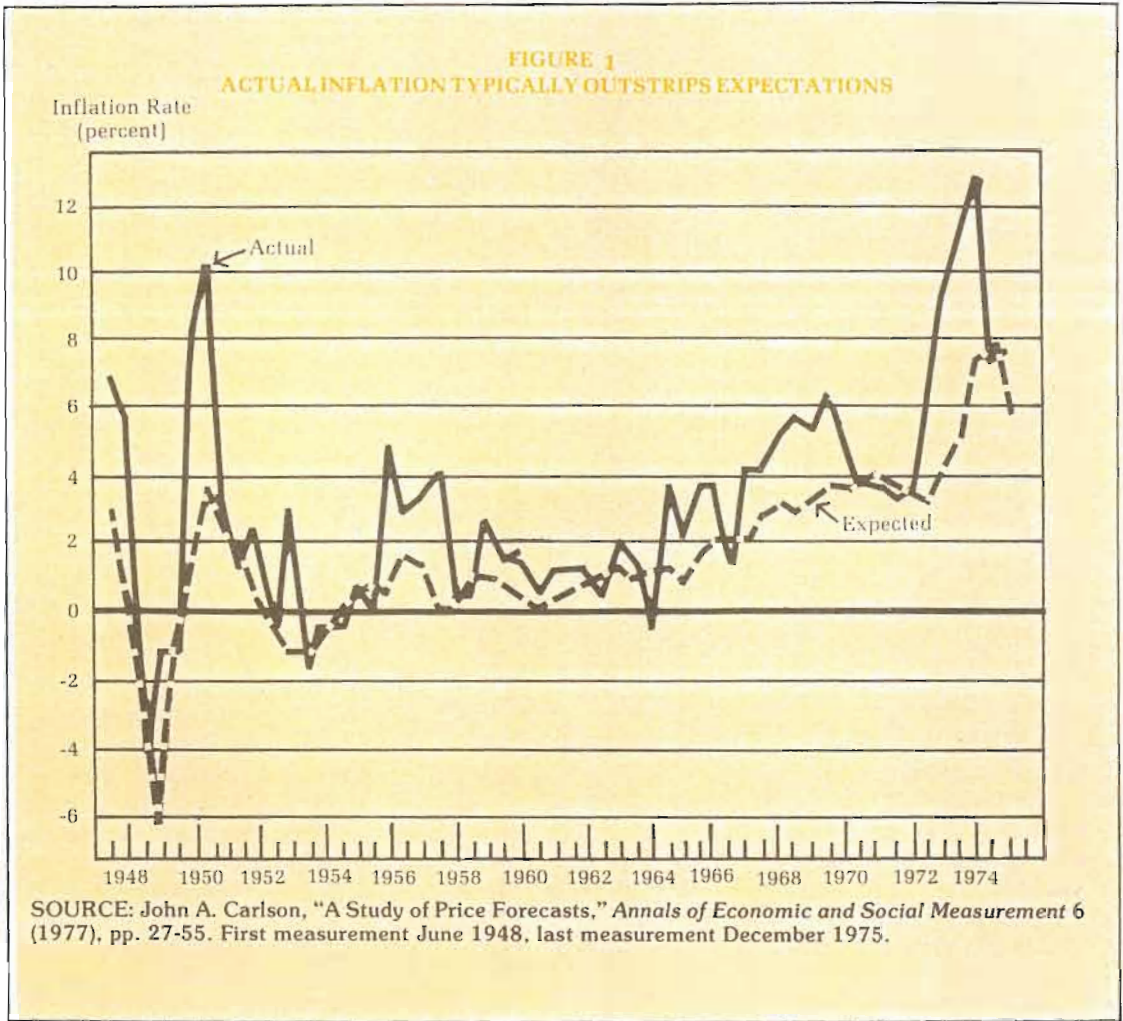
⁴See John A. Carlson, "A Study of Price Forecasts,"

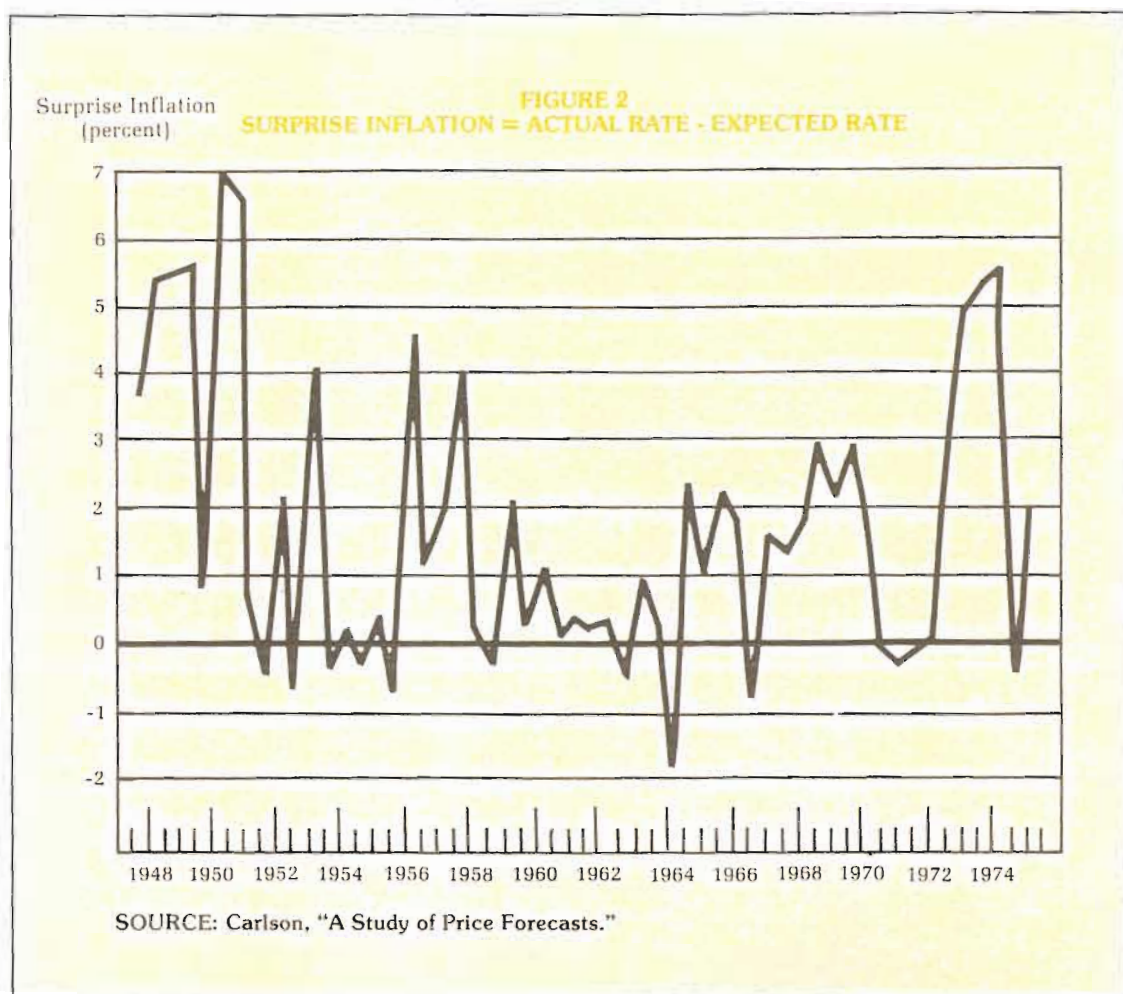
Fortunately, Carlson has obtained the original responses to the Livingston surveys and has calculated the expected rate of CPI inflation over 8-month and 14-month horizons. He presumes that forecasts are generated in May and November of each year and that the CPI levels of the previous month

(April and October) are the most recently available information at the time of the forecast. Carlson's calculation of the expected rate of CPI inflation over an 8-month horizon is shown graphically in Figure 1 along with the actual inflation rate over the forecast period.

How Accurate Were These Forecasts? Figure 2 shows the difference between actual and expected inflation, for which we'll use

Annals of Economic and Social Measurement 6 (1977), pp. 27-55..





the label 'surprise inflation'. Over the 29-year horizon of the Livingston surveys, surprise inflation usually has been positive. In other words, forecasters typically have underestimated the pace of CPI inflation. Indeed, surprise inflation was negative (inflation was overpredicted) on only 13 occasions out of the 58 surveys. The graph indicates also that inflation surprises are larger when forecasters underpredict than when they overpredict. The largest surprise inflations are associated with the onset of the Korean

War in 1950 and the so-called *shortage inflation* of 1973-74. The average surprise inflation for the whole horizon 1947-75 equals 1.80 percent. Because surprise inflation is highly variable, however, we're not able on statistical grounds to reject the hypothesis that the true inflation forecast error is zero.

The same sorts of characteristics hold true for inflation forecasts over longer periods (14 months and 18 months). Indeed, the consensus expected inflation rates on given dates

have been remarkably similar over different forecast horizons. This means that forecasters seldom envision a significant acceleration or deceleration of inflation when forecasting more than one period ahead.

The variations in expected inflation rates between surveys are somewhat larger than variations over different horizons as of a given survey date. Nevertheless, the between-survey changes seldom are abrupt. The advent of wage-price controls prior to the survey in 1971 was accompanied by a reduction in expected inflation of less than a percentage point, for example. And some reduction was likely to have occurred anyway, since actual inflation was decelerating prior to controls.

The results of the Livingston surveys for expected inflation as measured by the wholesale price index (WPI) are broadly consistent with the CPI results. The major exceptions are: (1) WPI inflation forecast errors (surprise inflations) are more frequently negative, though they remain positive on average, and (2) WPI forecasts are more volatile from one survey date to the next than the CPI predictions. The latter result isn't surprising, since actual WPI inflation is more variable than CPI price rises.

The fact that these inflation expectations frequently are off the mark need not imply that forecasters are using information inefficiently in forming predictions. To gauge their efficiency requires some consideration of how people generate predictions. This is precisely the issue addressed in the rational expectations literature.

ARE INFLATION FORECASTS RATIONAL?

For economists, the notion that people are rational serves much the same purpose as a teddy bear in the nursery: it gives them something to cling to when floundering in the dark. For a long while, economists were reluctant to address the issue of how people form expectations of things that matter in

the economic realm, such as inflation, interest rates, or government policies. Their feelings were that since expectations were psychological phenomena, they were best left to psychologists or mystics. Unfortunately, this meant that Zen Buddhists seemed better able than economists to explain things like long-term interest rates. To remedy this anomaly, economists began to consider the question of how people generate forecasts. Their answer: people are rational, and rationality requires that their predictions be based on the things that determine whatever they're forecasting. If today's price depends on yesterday's rainfall, then people will chart rain today to predict tomorrow's price. But that's not the whole ballgame. Most economic doings are affected by dozens of factors. It's not clear which are the most important and, furthermore, it's costly to collect and process information. Presumably people will mine additional information only as long as the benefits of doing so (as reflected in a smaller forecast error) exceed the costs.

What set of information do people use to forecast inflation? One cheap source of data is the past history of inflation itself. For example, if past inflation patterns suggest that a surge in inflation typically tends to persist for a lengthy period, people might project recent behavior into the future. Alternatively, if past information shows that inflationary bursts are followed quickly by a return to some normal rate, then inflation forecasts presumably would take account of this. Indeed, a rational inflation forecast is defined as one that has the same relationship to the information set (the past history of inflation, in our example) as does the actual rate of inflation.

The suggestion that people make rational inflation forecasts is easy to test. All we need to do is estimate the relationship between surprise inflation (the forecast error) and the information used to forecast (by assumption, the recent history of inflation). If forecasts are rational, we should find no relationship at all between surprise inflation and past

inflation rates. For the period 1959-69, this is exactly what was found in our statistical tests.⁵ Hence the evidence is consistent with the view that inflation forecasts were rational in their use of information on the past history of inflation, over this 10-year period at least. Though forecasters underpredicted inflation on average, their errors do not reflect misuse of available inflation information.

The tests described above are quite restrictive since they assume that forecasters consider only the past history of inflation when they estimate future inflation. Yet looking at inflation history is the forecasting mechanism most frequently employed by economists. More research needs to be done to determine whether forecasters use other information, such as data on the state of the economy or on current or anticipated monetary and fiscal policies, to form inflation predictions.⁶ If the evidence continues to suggest that expectations rationally incorporate relevant information, the message will be that the scope for effective countercyclical stabilization policies is much smaller than many people have thought.⁷

The rationality issue relates to the question of whether forecasters accurately anti-

cipate the inflation rate. In particular, it is concerned with the accuracy of point forecasts of future inflation. (A point forecast is a single number that summarizes a forecaster's best guess about future inflation.) But accuracy isn't the only issue. There are important reasons for economists and policymakers to worry about how firmly people hold their inflation expectations.

UNCERTAINTY AND INFLATION FORECASTS

The world works one way when people are *perfectly certain* that next year's inflation will be 5 percent. It works another way when their *best guess* is for 5 percent, but they suppose that any rate between 0 percent and 10 percent also is quite possible. One method economists use to measure the degree of uncertainty in peoples' inflation expectations is to calculate the standard deviation of the probability distribution that describes their outlook (see Figure 3). A larger standard deviation means that people are more uncertain about future inflation and hence regard their forecast (the mean or average value of the same probability distribution) as more shaky.

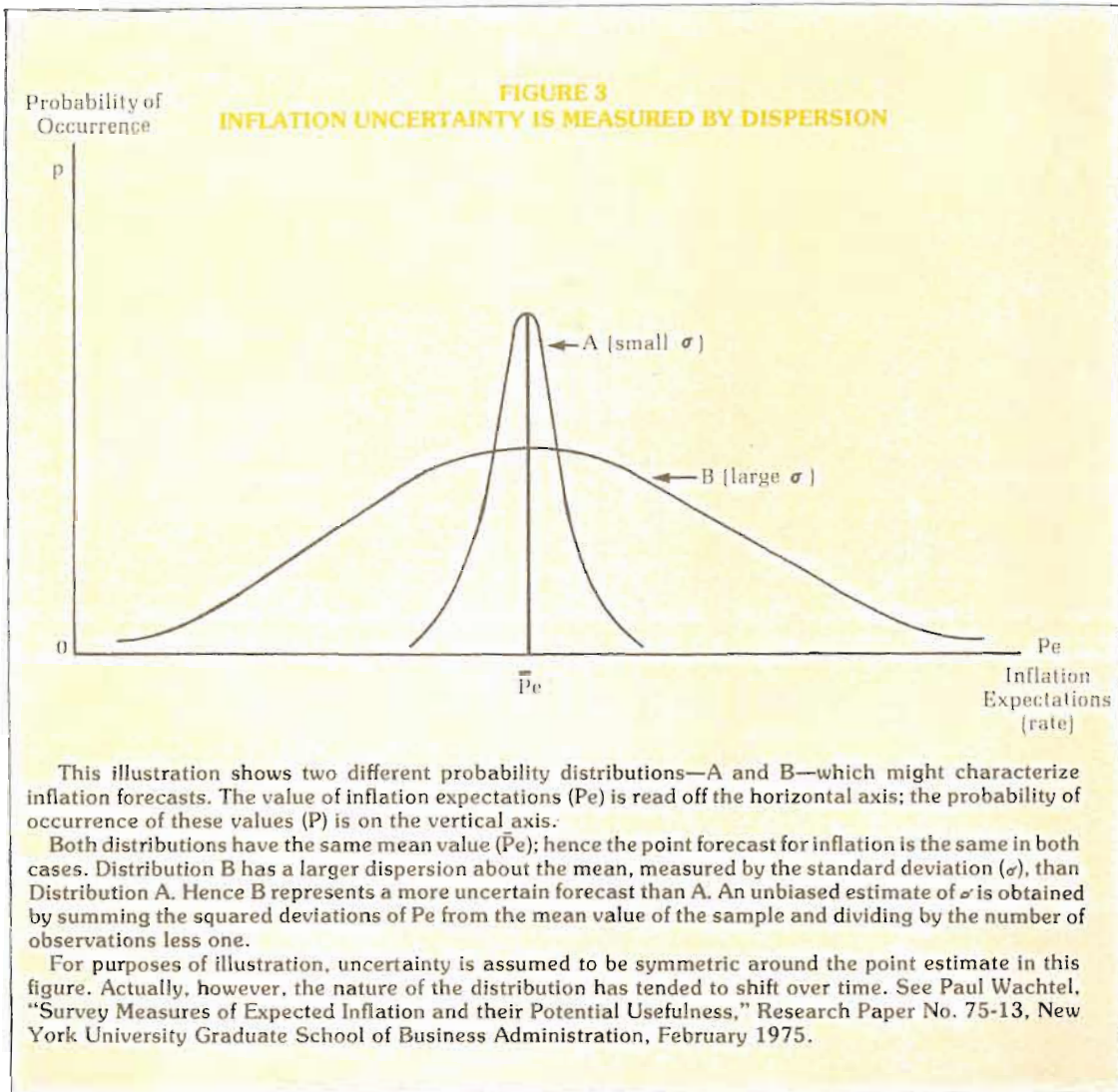
Livingston's survey data are used to calculate such a measure for the expected rate of CPI inflation eight months ahead in Figure 4. There was much more disagreement about future inflation soon after World War II than there has been in more recent years. Comparing Figures 2 and 4 we see that uncertainty heightens during periods when surprise inflation increases. The periods 1969-70 and 1973-75 dramatically illustrate this point. Indeed, the only period involving rela-

⁵For a discussion of the tests, see Donald J. Mullineaux, "More on the Rationality of the Livingston Price Expectations Data," Research Paper No. 26, Federal Reserve Bank of Philadelphia, June 1977.

⁶Some preliminary tests indicate that the Livingston forecasters have incorporated money-growth information in their predictions. See Donald J. Mullineaux, "Inflation Expectations and Money Growth: Some Empirical Tests," Research Paper No. 28, Federal Reserve Bank of Philadelphia, forthcoming. For a description and discussion of other tests for rationality in expectations formation, see Marcelle Arak, "Rational Price Expectations: A Survey of the Evidence and Implications," Research Paper No. 7716, Federal Reserve Bank of New York, March 1977.

⁷Some scope remains, however, if prices cannot adjust to changes in supply and demand. For discussion, see Stanley Fischer, "Long-Term Contracts, Rational Expectations, and the Optimal Money Supply Role," *Journal of Political Economy* 85 (January 1977),

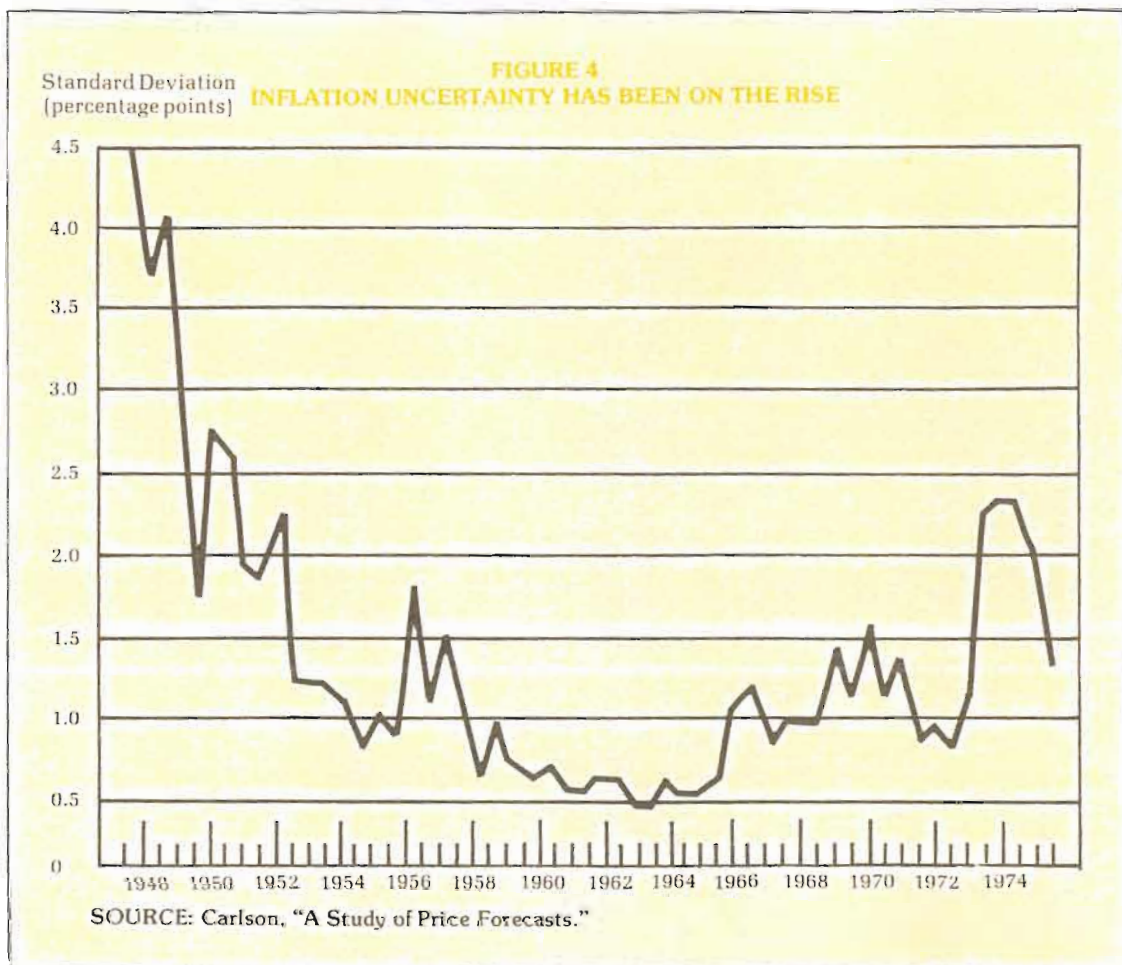
pp. 191-205. Completely inflexible prices seems an unrealistic assumption. If firms adjust prices slowly because price changes are costly, then the rational expectations argument concerning the effectiveness of policy still holds. See B. T. McCallum, "Price-Level Stickiness and the Feasibility of Monetary Stabilization Policy with Rational Expectations," *Journal of Political Economy* 85 (June 1977), pp. 627-634.



tively little uncertainty about future inflation was 1960-65, when unanticipated inflation was quite small by historical standards.

What are the consequences of increased uncertainty about the outlook for inflation? Since people appear to dislike uncertainty of almost any kind, they are automatically worse off when future inflation becomes

more problematical. How much so no one knows, since economists have yet to gauge peoples' distaste for uncertainty. But besides affecting our sense of well-being, increased uncertainty also prompts us to behave differently and hence weighs on the pace of economic activity. For example, a more ambiguous inflation outlook produces high-



er long-term interest rates⁸ as well as greater variability in interest yields regardless of maturity. The higher level of interest rates reflects the fact that people demand higher rewards for holding longer term securities when they're more uncertain of the net return after adjusting for inflation. The greater variability in yields is explained by

⁸There is evidence to support this contention. See Eugene Fama, "Inflation Uncertainty and Expected Returns on Treasury Bills," *Journal of Political Economy* 84 (June 1976), pp. 427-448.

the fact that heightened ambiguity about the inflation outlook generates increased activity in financial markets. The increased volume of trading will cause interest rates to fluctuate more than when uncertainty is minimal. If these developments affect investors' perceptions or expectations of the inflation-adjusted interest rate (the real interest rate, in economists' jargon), then the pace of production in the economy will be influenced. Though the evidence is scant, many economists believe that aggravated uncertainty in the inflation outlook does reduce

spending on plant and equipment. Indeed, some have interpreted weakness in investment spending in the current recovery to be a reflection of the equivocal prospects for future inflation. The smaller stock of productive equipment in turn spells lower production and a reduced rate of economic growth.

Heightened uncertainty about future inflation is likely to affect the composition of investment and savings as well. Both activities become more speculative in character, as firms use their inventories to play the market and savers turn to commodity or real estate speculation. To the extent that resources ultimately are devoted to less productive uses, the economy suffers. Nor is this the end of the tally sheet. Inflation uncertainty also increases the cost of contracting over longer periods and reduces the effectiveness of the price system as a resource-allocation device. The former effect means that buyers and sellers must devote more time and energy to negotiating and transacting, so that less time is available for production. The latter result stems from the fact that when the price level is highly variable, it is difficult to recognize a shift in relative prices (the price of one good compared to another). But it is changes in relative prices that are supposed to signal shifts in resources toward more highly valued activities. In his Nobel lecture, Milton Friedman suggests that the conditions produced by increased uncertainty about future inflation—such as more frequent contract adjustments and reduced efficiency of the price system—are likely to bring on a higher unemployment rate.⁹

There are, of course, ways to reduce some of the costs associated with inflation uncertainty. The so-called *indexed contract* in which, say, wages or interest rates are changed automatically to reflect shifts in some overall

measure of inflation is one example of such a device.¹⁰ But establishing and maintaining an indexing program is itself a costly venture and would not be necessary if inflation were highly predictable.

This menu of costs associated with inflation uncertainty is by no means exhaustive. And the Livingston survey data suggest that, on average, inflation uncertainty from late 1973 to 1975 has more than tripled relative to that of the early 1960s.¹¹ This suggests that the dollar costs involved probably are quite large and that policymakers need to proceed cautiously so as not to aggravate the situation. For while some of the heightened uncertainty reflects uncontrollable factors such as the OPEC oil price increase, part of it no doubt is related to a recent increase in the variability of the rate of money growth. To keep people from expecting higher inflation and to reduce their uncertainty about inflation will prove a very delicate task. It will require not only a reduction in the *average* rate of money growth, but also a slackening of the *variability* of the money-growth rate. Indeed, the surest way to prevent variations in money growth from being a source of inflation uncertainty would be to set a constant growth rate for money and stick to it. Indeed, this is just the policy prescription proposed by rational expectations theorists who contend that varying the money-growth rate has no systematic effect on the overall rate of production or on unemployment.

⁹ See Milton Friedman, "Nobel Lecture: Inflation and Unemployment," *Journal of Political Economy* 85 (June 1977), pp. 415-472.

¹⁰ For discussions of the pros and cons of indexing, see H. Giersch et. al., *Essays on Inflation and Indexation* (Washington, D. C.: American Enterprise Institute, 1974).

¹¹ Recall that these forecasters are presumed to possess more expertise than the average person. For the general public, inflation uncertainty no doubt typically exceeds that which pertains among more knowledgeable forecasters. In addition, the increase in uncertainty among the public at large over the period 1973-75 probably was greater than what we observe for the experts.

A SUMMARY VIEW

Economists owe a debt of gratitude to Mr. Livingston for his efforts to measure price expectations over a long period of time and to John Carlson for investigating the problem of how to use these data to calculate inflation expectations. While these measures are, at best, flawed estimates of the public's true inflation expectations, they do permit us to analyze some important issues.

Inflation expectations are not, in Southey's phrase "a perfect nonplus and a baffle to all human understanding." Rather, they vary over time in a somewhat predictable fashion and seem to reflect in a rational way all the information available in the past history of inflation rates. Whether forecasters use other information to gauge the inflation outlook is a question that deserves additional research.

Mushrooming inflationary expectations, however, are only part of our problem. The inflation outlook itself has become considerably more cloudy. This increase in uncer-

tainty has been little publicized relative to the behavior of expectations, but its social costs surely are quite substantial.

Policymakers face the colossal predicament of trying to sway the public to become less perplexed about future price increases while they simultaneously combat high unemployment and inflation. Those who believe that expectations are rational have recommended a policy course; since expected money growth affects only inflation and not unemployment, the Federal Reserve should announce a much lower growth-rate target for money and forever stick to it. The Fed has adopted an alternative course—one of gradually reducing money growth so as not to aggravate unemployment. The key test will come when either unemployment or interest rates begin to rise significantly. If the Fed abandons its money-growth strategy, it's hard to imagine much further progress being made against inflation or against uncertainty about inflation's future.