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# Uncertainty Costs of High Inflation

*By Deborah A. Frohman, Leroy O. Laney, and Thomas D. Willett**

Is reducing inflation really worth what it costs?

There is little disagreement among economists and policymakers that the rate of increase in the general price level, which began to rise markedly about 15 years ago, is a very serious economic problem. Reducing it has been accorded top priority by those formulating U.S. policy, including the Federal Reserve. But policy pronouncements are almost always accompanied by warnings that bringing inflation down to a more acceptable level can be costly and painful in the intermediate run. During a transition, while expectations adjust, there will be substantial lost output and high unemployment. Moreover, the climb in interest rates to the levels experienced recently in the United States tests even the resolve of some of those most convinced of the crucial role of tighter monetary policy in the process of reducing inflation.

Even if there is widespread agreement that inflation is too high, the high interest rates and unemployment accompanying the adoption of restrictive macroeconomic policy are obviously a source of considerable dissatisfaction. This, in turn, can foster an opinion that the cure is worse than the disease.

Estimates from some large macroeconometric models suggest it can take many years of high unemployment and reduced output to cure inflation. Such estimates have led some to argue that learning to live with the current level of inflation would be preferred to eliminating it. However, recent developments in the analysis of expectations have suggested that these results may substantially overstate the length of time and consequent unemployment costs required to cure inflation.[1]

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1. For a discussion and comparison of the results for various models, see Laurence H. Meyer and Robert H. Rasche, "On the Costs and Benefits of Anti-Inflation Policies," *Review*, Federal Reserve Bank of St. Louis, February 1980. A number of useful contributions on the role of expectations in the inflation reduction process are found in the *Journal of Money, Credit, and Banking*, November 1980, pt. 2, a special issue containing the papers and proceedings of a seminar on rational expectations that was sponsored by the American Enterprise Institute for Public Policy Research.

Furthermore, even if the time frame for eliminating inflation is uncomfortably long, many analyses have not fully recognized inflation's costs. In particular, continued high rates of inflation are unlikely to be steady or predictable. Living with inflation thus involves substantial uncertainty that itself depresses employment and worsens overall economic performance. Recognition of these uncertainty costs of inflation strengthens the case for adoption of serious anti-inflation policies despite the considerable transitional pain that is likely to be involved. The following article addresses this issue.

### Obsolescence of the Phillips Curve as a guide to policy

The menu of policy choices in earlier years presumed a short-run trade-off between inflation and unemployment, embodied in the traditional Phillips Curve. However, it has been recognized increasingly that thinking in terms of a negative relationship between these two variables can be a misleading guide to policy. Only in the short run, as the economy adjusts to unanticipated changes in economic variables, will a negative relationship hold. Over the long run, output and employment are likely to be lower because of inflation than they would be otherwise.

Many analyses have overlooked this positive long-run relationship and, consequently, underestimated the costs of high inflation. It is true that if inflation were held at a perfectly steady and predictable level, even one that was high by historical standards, lost economic efficiency and income redistribution costs might be relatively low. Costs of changing prices frequently would remain, but inflation could be accurately incorporated into contracts and loans. Distortions would still exist because of difficulties in indexing everything, but these might not be great. A major uncorrectable cost would be an "inflation tax" on non-interest-bearing money balances, but even this could be relatively low.[2] The real problem is that inflation is actually not steady or predictable.

### The costs of uncertainty about inflation

In recent years greater recognition of the variability of inflation has developed, along with an awareness that accompanying uncertainty can be quite damaging to the economy.[3] As inflation becomes more variable and future price level movements become more uncertain, more resources must be devoted to attempts at forecasting general inflation. Even if these efforts are successful, some opportunity cost is involved, but it is quite likely that forecast errors will increase with more variable inflation. This means additional inefficient allocation of resources as wrong decisions are made more often. The role played by relative prices in the efficient allocation of resources is impaired, and the usefulness to economic planning of the signals from the price system is reduced. The information content of these signals is less because of uncertainty about whether a given price movement reflects a change in relative prices or general inflation.

Furthermore, the very prospect of increased uncertainty about price level developments is likely to depress economic activity directly. Because it is feared that a wrong decision will be made, participants in the economy may simply opt for doing nothing in some cases. For any given level of expected return on an undertaking, economic activity is riskier. The planning horizon is also shorter. Hence, the level of activity by normally risk-

2. It is even possible that for some levels of steady inflation, the rate of increase in prices would be below an "optimum" inflation tax. Instead of striving for a negative rate of inflation that would compensate for the opportunity cost of holding non-interest-bearing money balances—as suggested by Milton Friedman, *The Optimum Quantity of Money and Other Essays* (Chicago: Aldine Publishing Company, 1969), chap. 1—the optimum inflation tax would equate the marginal excess burden from the inflation tax with that on other forms of taxation. The optimum rate of inflation on these grounds will be positive. For discussion, see Edward Tower, "More on the Welfare Cost of Inflationary Finance," *Journal of Money, Credit, and Banking*, November 1971, and Robert J. Gordon, "The Demand for and Supply of Inflation," *Journal of Law and Economics*, December 1975.

3. More variable inflation would not necessarily imply greater uncertainty if it followed a highly predictable pattern, but this is unlikely to be the case. It is practical to view variability of inflation and uncertainty about inflation as having a strong positive relationship. This relationship will be considered here in more detail later.

4. See, for example, Donald J. Mullineaux, "Unemployment, Industrial Production, and Inflation Uncertainty in the United States," *Review of Economics and Statistics*, May 1980, and Maurice D. Levi and John H. Makin, "Inflation Uncertainty and the Phillips Curve: Some Empirical Evidence," *American Economic Review*, December 1980.

averse economic agents is reduced. Recent studies have found that greater uncertainty about price level developments in the United States has had significant effects in raising unemployment and lowering industrial production.[4] Such uncertainty can also raise interest rates and depress investment.[5]

### Association of higher inflation levels with greater uncertainty about inflation

Of course, these costs of more uncertainty about inflation can be used to support a case for bearing the pain of reducing inflation only if lower inflation rates are likely to be associated with more certain price level developments. If uncertainty is independent of the level of inflation, restoration of lower average inflation rates will do nothing to reduce this uncertainty over the longer run.

It seems likely, however, that at higher rates of inflation, price level developments will become more uncertain. The effect of this uncertainty will be more important as estimates of future inflation become more crucial in determining profitability of activities relative to real economic factors.[6] In a higher-inflation world, psychological imponderables may become increasingly important relative to real economic factors, and significant shifts in expectations may become larger and more frequent.[7] For any given set of underlying circumstances, there would likely be greater variability in the behavior of the private sector.

Moreover, it would seem much more difficult to establish the credibility of steady macroeconomic policies at high inflation levels than at low ones. Persistent short-run accommodation of economic shocks is likely to lead to intermittent upward ratchets of inflation rates over time. Inconsistent macroeconomic policies driven by short-run political pressures reinforce tendencies for private sector expectations and behavior to become more variable at higher inflation rates.[8]

While there is a need for more theoretical work in this area, these arguments present a strong case for expecting a significant positive relationship between the rate and the variability of inflation, and such a relationship has been used to explain the currently observed correspondence between high inflation and high unemployment.[9] Based on previously published studies, however, it is not entirely clear that such a relationship does indeed hold for the United States. Empirical work has indicated that, on average, countries with higher inflation also have more variable inflation. This has not held for all time periods, though, nor for some groups of countries when the inflation rate falls in a certain range. Most of the previous empirical work has examined cross-sectional data, comparing average relationships across countries.[10]

5. For the effect of inflation uncertainty on interest rates, see Amir Barnea, Amihud Dotan, and Josef Lakonishok, "The Effect of Price Level Uncertainty on the Determination of Nominal Interest Rates: Some Empirical Evidence," *Southern Economic Journal*, October 1979. For effects on investment, see Stephen L. Able, "Inflation Uncertainty, Investment Spending, and Fiscal Policy," *Economic Review*, Federal Reserve Bank of Kansas City, February 1980, and Gary D. Praetzel, "How Inflation Has Affected Investment Decisions," *Voice of the Federal Reserve Bank of Dallas*, June 1981.

6. For example, a real rate of return of 3 percent on an undertaking would account for 60 percent of a 5-percent nominal return in a world in which expected inflation is 2 percent. But if expected inflation is 9 percent and the nominal return is 12 percent, the real return of 3 percent only constitutes 25 percent of the total.

7. In Mohsin S. Khan, "The Variability of Expectations in Hyperinflations," *Journal of Political Economy*, August 1977, it is demonstrated that in hyperinflationary situations at least, the higher the level and the greater the change in inflation, the faster expectations are revised.

8. For discussions on these points, see William Fellner, *Towards a Reconstruction of Macroeconomics: Problems of Theory and Policy* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1976), and Arthur M. Okun, "The Mirage of Steady Inflation," *Brookings Papers on Economic Activity*, 1971, no. 2.

9. See Milton Friedman, "Nobel Lecture: Inflation and Unemployment," *Journal of Political Economy*, June 1977. (Okun, "Mirage of Steady Inflation," suggested an opposite view that more variable inflation will result from a negatively sloped, static Phillips Curve trade-off between inflation and unemployment if the economy is operating in the steeper, higher-inflation segment of the curve. Deborah Frohman, "The Relationship Between the Rate and Variability of Inflation," senior thesis, Claremont Men's College, August 1980, does not find empirical support for this explanation, presumably because of the shiftability of inflation-unemployment relationships.)

10. For empirical contributions analyzing the cross-sectional relationship between the rate and variability of inflation, see: Okun, "Mirage of Steady Inflation"; Robert J. Gordon, "Steady Anticipated Inflation: Mirage or Oasis?" *Brookings Papers on Economic Activity*, 1971, no. 2; Dennis E. Logue and Thomas D. Willett, "A Note on

### A time series versus a cross-sectional approach and proxies for uncertainty

Ideally, we would like to know not so much the relationships across countries as the relationship for individual countries over time as their rates of inflation vary. This kind of analysis was unwieldy in earlier work studying the relationships between the average level of inflation and its standard deviation, because the number of observations needed to calculate standard deviations was relatively large.[11] The use of other proxies for uncertainty does allow the study of these relationships for individual countries over time, and that is the approach taken here.

In using this approach, the first step is to choose a time series proxy for uncertainty about inflation. At the outset, this raises the question of whether higher observed variability in the inflation rate necessarily indicates greater uncertainty. Although they are generally assumed to be closely associated, highly variable inflation need not lead to greater uncertainty. If economic agents base their expectations on variables other than past inflation and these variables are predictable, high inflation variability can be accompanied by low uncertainty. This seems highly unlikely to occur frequently in practice, however, and recent empirical work supports the case that forecast uncertainty does tend to increase with the variability of inflation.[12] Thus, the assumption that higher variability of inflation is associated with greater uncertainty seems quite plausible.

The most commonly used proxy for inflation uncertainty is either the standard deviation of the inflation rate in cross-sectional work or some form of moving standard deviation in an individual-country time series approach. However, since a systematically changing, and therefore predictable, inflation rate can have as high a standard deviation as one that fluctuates randomly, a standard

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the Relation Between the Rate and Variability of Inflation," *Economica*, May 1976; Dwight Jaffee and Ephraim Kleiman, "The Welfare Implications of Uneven Inflation," in *Inflation Theory and Anti-inflation Policy*, proceedings of a conference held by the International Economic Association at Saltsjobaden, Sweden, ed. Erik Lundberg (Boulder, Colo.: Westview Press, 1977); and Edward Foster, "The Variability of Inflation," *Review of Economics and Statistics*, August 1978.

Among these, Okun and Gordon simply examined cross-sectional scatter diagrams of the data. Okun found a strong positive correspondence between high average inflation and the standard deviation of inflation over 1951-68 for 17 industrial countries, but Gordon argued that the relationship existed only for the first part (1951-59) of the interval Okun examined. Jaffee and Kleiman tested the relationship with regression techniques; they found a positive relationship for both subperiods but a significant relationship statistically only for the earlier period. They also examined Latin American countries and found a positive relationship cross-sectionally.

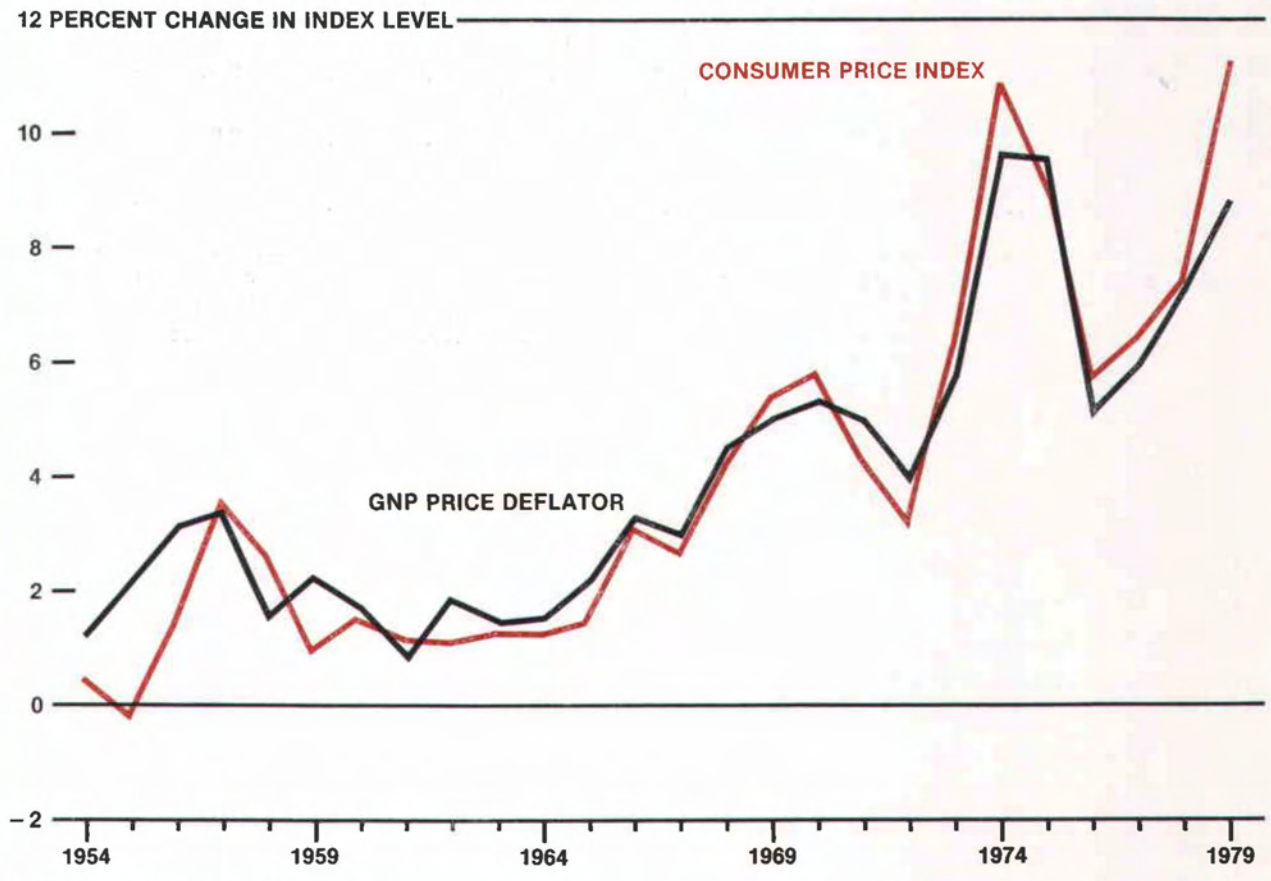
Logue and Willett examined 41 countries cross-sectionally over the 1949-70 period. They analyzed different subperiods and groups of countries and used both standard deviations and naive forecast errors to gauge uncertainty. Results were generally strong and positive; however, countries with relatively low rates of inflation showed no significant relationship between the inflation rate and its standard deviation, and highly industrialized countries demonstrated a weak negative relationship.

Foster, who suggests using the average absolute year-to-year change in inflation (rather than standard deviation) as the measure of cross-sectional variability, examined 23 advanced economies and 17 Latin American economies over 1954-75 and subperiods thereof. Foster's results confirm a strong positive relationship between the rate and variability of inflation.

11. In one of the few published studies to date attempting to measure the possibility of a relationship between the rate and variability of inflation over time, "Our New Monetary Standard: The Measurement and Effects of Price Uncertainty, 1880-1973," *Economic Inquiry*, December 1975, Benjamin Klein contends (using a six-term moving average of annual differences in the natural log of the GNP deflator as the measure of expected inflation and a six-term moving standard deviation of the same series as the measure of variability) that there has not been the positive relationship between the rate and variability of inflation postulated by other analysts. Klein argues that his mean measure was high by U.S. historical standards over the last decade of his analysis while the variability measure was low over the same period. A relationship between the rate and variability of inflation may exist across countries, Klein concludes, but does not seem to have existed recently for the United States.

12. For example, Alex Cukierman and Paul Wachtel, "Differential Inflationary Expectations and the Variability of the Rate of Inflation: Theory and Evidence," *American Economic Review*, September 1979, using a moving standard deviation in order to measure inflation variability and using the dispersion among respondents' inflation forecasts in surveys by the University of Michigan Survey Research Center and by Livingston (published in the *Philadelphia Inquirer*) in order to measure uncertainty, find a positive correlation for the 1948-75 period. Douglas W. Mitchell, "Determinants of Inflation Uncertainty," *Eastern Economic Journal*, April 1981, provides evidence that uncertainty about inflation is related to both its variability and the level of inflation expectations.

## Annual Rates of Change in U.S. Consumer Price Index and GNP Price Deflator




SOURCES: U.S. Department of Commerce.
U.S. Department of Labor.

**Table 1**

## CORRESPONDENCE BETWEEN FORECAST ERROR AND U.S. INFLATION RATE, 1954-79

($|p_t - p_{t-1}| = a_0 + a_1 p_{t-1}$)

| | Price level measure | Constant | $p_{t-1}$ coefficient | $\bar{R}^2$ | SEE | DW | Rho |
|---|---|---|---|---|---|---|---|
| Equation 1 ... | Consumer price index | .55<br>(1.70) | .22<br>(3.10)** | .26 | 1.03 | 1.89 | |
| Equation 2 ... | GNP price deflator | .27<br>(1.16) | .20<br>(3.84)** | .32 | .87 | 2.01 | -.45 |
| Equation 3 ... | Consumer price index | .51<br>(2.01) | .16<br>(2.32)* | .19 | .75 | 2.05 | |
| Equation 4 ... | GNP price deflator | .11<br>(.59) | .27<br>(5.08)** | .56 | .63 | 2.46 | -.45 |

NOTE: Figures in parentheses are *t* statistics; * indicates significance of the independent variable at the 95-percent level, using a single-tail test that the variable is signed as hypothesized, and ** indicates significance at the 99-percent level.
$\bar{R}^2$ is the correlation coefficient adjusted for degrees of freedom. SEE is the standard error of the equation. DW is the Durbin-Watson autocorrelation test statistic. Rho is the first-order autocorrelation coefficient when a Cochrane-Orcutt procedure was used to correct serial correlation of residuals.

**Table 2**

## RESULTS USING ALTERNATIVE MEASURES OF UNCERTAINTY AND EXPECTATIONS ABOUT INFLATION, 1954-76

(Dependent variable = Carlson's standard deviation of Livingston forecasts)

| | Constant | $p_{t-1}$ | Carlson's mean expected inflation | $\bar{R}^2$ | SEE | DW | Rho |
|---|---|---|---|---|---|---|---|
| Equation 5 ... | .60<br>(3.05) | .10<br>(2.49)* | | .41 | .34 | 1.70 | .49 |
| Equation 6 ... | .56<br>(2.39) | | .15<br>(2.23)* | .38 | .35 | 1.65 | .51 |

NOTE: Figures in parentheses are *t* statistics; * indicates significance of the independent variable at the 95-percent level, using a single-tail test that the variable is signed as hypothesized.
$\bar{R}^2$ is the correlation coefficient adjusted for degrees of freedom. SEE is the standard error of the equation. DW is the Durbin-Watson autocorrelation test statistic. Rho is the first-order autocorrelation coefficient when a Cochrane-Orcutt procedure was used to correct serial correlation of residuals.

deviation can be a poor measure of variability and uncertainty. The standard deviation computed from a series of observations is independent of the serial pattern of those observations. Furthermore, a rising rate of inflation over time will generate a spurious positive association between the average rate of inflation and its standard deviation, and a declining trend will cause a downward bias. These considerations argue against use of this measure. Empirical work to follow uses a simple forecast error method to gauge uncertainty, which overcomes problems in using a standard deviation.[13]

### Empirical tests and results

In the first test here, the difference between the actual inflation rate for a period and the value that was predicted for the period is taken as the proxy for uncertainty. The assumption is that the higher this forecast error, the greater is the economic agent's subjective distribution of possible future inflation rates. Expectations about inflation are assumed here to be generated by a simple adaptive expectations process, in which all inflation forecasts project no change in the inflation rate from the previous year. Such expectations can be proxied in a number of ways, of course. For example, prior inflation rates over time can be analyzed for any systematic movement.[14]

The absolute value of the difference in inflation rates is used, since the only concern here is the magnitude of the difference. This error measure is regressed against the earlier year's inflation rate, representing the level of inflation in the year with which the error was associated historically. In equation form:

$$|p_t - p_{t-1}| = a_0 + a_1 p_{t-1},$$

where $p_{t-1}$ is the rate of inflation in year $t-1$ and $|p_t - p_{t-1}|$ is the error between the inflation forecast for period $t$, $p_{t-1}$, and the actual value in period $t$, $p_t$.[15]

This model was estimated using annual rates of change in both the consumer price index and the GNP (gross national product) price deflator for 1954 through 1979, an interval beginning just after the Korean War inflation and ending in the latest year for which data were available when the tests were conducted. Results are reported in Table 1. Equations 1 and 2 were run over the entire interval for inflation rates of the consumer price index and the GNP deflator, respectively. Coefficients on the $p_{t-1}$ variable are both significant statistically, and they are close in value.[16]

In equations 3 and 4, the same regressions were run with certain years excluded—those in which, it might be argued, the variability of inflation was due to special factors rather than the general operation of the inflationary process. The years 1971 and 1972 were exceptional with respect to inflationary expectations because of the constraining influence of wage and price controls in the United States; then, when controls were removed and pent-up pressure was released, expectations may have been greater that prices would surge. Certainly, 1974 and 1979 were exceptional. The oil-related shocks then were unusual compared with previous experience and were unanticipated.

Omitting these observations (which also requires exclusion of the following year in each case because of the way the equation is specified) yields one comparison with coefficients in equations 1 and 2. The $p_{t-1}$ coefficients in the second two equations

13. For illustration of problems in using the standard deviation method, see Foster, "Variability of Inflation."

14. Several types of forecasting models, including autoregressive integrated moving average (ARIMA) models, have been used with this method of measuring uncertainty. See, for example, I. B. Ibrahim and Raburn Williams, "Price Unpredictability and Monetary Standards: A Comment on Klein's Measure of Price Uncertainty," and Benjamin Klein, "The Measurement of Long- and Short-Term Price Uncertainty: A Moving Regression Time Series Analysis," both in *Economic Inquiry*, July 1978, and Frohman, "Relationship Between the Rate and Variability of Inflation."

15. One might argue that it is just as appropriate to associate the absolute error term with $p_t$ as the independent variable rather than $p_{t-1}$. This would compare the previous year's forecast error with the inflation level in the current year, but near the end of the period at least, both variables would be known to economic agents. Equations were estimated using both specifications. Results using $p_t$ as the independent variable do not contradict findings using $p_{t-1}$. In general, the outcomes were quite similar.

16. Equations using $p_t$ as the independent variable rather than $p_{t-1}$, corresponding to equations 1 and 2 in Table 1, are the following ($t$ statistics in parentheses):

(1a) $|p_t - p_{t-1}| = \underset{(1.03)}{.27} + \underset{(5.12)}{.27}\, p_t$

$\bar{R}^2 = .50$; SEE $= .84$; DW $= 2.09$.

and

(2a) $|p_t - p_{t-1}| = \underset{(1.18)}{.29} + \underset{(3.63)}{.18}\, p_t$

$\bar{R}^2 = .28$; SEE $= .89$; DW $= 1.96$; rho $= -.46$.

are fairly close to those in the first two. The coefficient falls somewhat using the consumer price index and rises using the GNP deflator. Presentation of equations 3 and 4 provides a check on the stability and significance of coefficients over the interval investigated.[17]

In addition to the naive forecast error model, a model using direct survey data was estimated. Data from the original source, the Livingston survey of consumer price inflation forecasts of professional economists that has been published periodically in the *Philadelphia Inquirer*, were recently revised (through 1976) by Carlson.[18] The standard deviation of these revised data provides a time series of a directly observed measure of uncertainty about inflation, on the assumption that a wider dispersion of individual forecasts is positively associated with greater uncertainty in each forecaster's mind.

This standard deviation was first regressed against the inflation rate for the year in which the forecast was made. (For example, the standard deviation of the forecasts for inflation in 1970 that were made in 1969 was regressed against the actual inflation rate in 1969.) Results for the same interval as before, shown as equation 5 in Table 2, indicate the inflation rate is statistically significant.

Furthermore, the standard deviation of these expectations was regressed against the mean of the expectations to test whether higher expectations are associated with higher uncertainty. This mean of expectations also demonstrates significant explanatory power with respect to the standard deviation in equation 6.[19]

Although these investigations focus on forecast errors and expectations formation over the relatively short time frame of up to one year, it is also interesting to look at a somewhat longer period and assume a more extended process of expectations formation. Such a process was not the explicit focal point of the present analysis but can well be the subject of future experimentation. One investigation worth mentioning, however, substituted for $p_{t-1}$ in the first naive forecast error equation an average of inflation over the previous four years to proxy actual and expected inflation. While the outcomes were similar to equations 1 and 2 in Table 1, the results were not as significant. In some equations, a term was added to measure inflation's deviation from trend, but this term was usually insignificant statistically.[20]

17. Among other modifications of the basic interval analyzed were rolling regressions—simply adding and/or subtracting data points from the 1954-79 sample to test for stability and significance of coefficients over time. The existence of threshold effects was also investigated. (For example, below or above some threshold level the relationship between the forecast error and the level of inflation might change.) These modifications also produced some variation in results, but perhaps understandably so since degrees of freedom were often substantially diminished. Usually the coefficient on the independent variable did indicate a positive association with the forecast error term, and in many cases results reinforced those presented in Table 1. For threshold results in investigating differential effects above 3-percent inflation, for example, the $p_{t-1}$ coefficient for the consumer price index was .23, quite close to that in equation 1.

18. See John A. Carlson, "A Study of Price Forecasts," *Annals of Economic and Social Measurement*, Winter 1977.

19. Dividing the interval examined in equations 5 and 6 into two subperiods—breaking the interval at 1965—does indicate a shift in the relationship, however. The early subperiod shows only very weak statistical significance for the actual inflation rate and none for the mean of the inflationary expectations variable. But in the latter subperiod, $t$ statistics for both variables rise markedly (to 4.14 and 5.00, respectively), even though the coefficients themselves change only slightly from those computed for the entire interval in equations in the table (to .11 from .10 and to .19 from .15).

20. Another avenue in the area of a longer time frame was explored using the analysis of Klein, "Our New Monetary Standard," as a springboard. Regressing a six-term moving standard deviation of the annual inflation rate, as the dependent variable proxying uncertainty, on a six-term moving average of the rate in several equations over the post-World War II interval (Klein compares graphically over the 1880-1973 period the variables regressed in our study over modern times only), a highly significant positive correspondence was usually found for both measures of the price level. For the 1958-79 interval—several observations are lost in computing moving averages and standard deviations—results for the inflation rates of the price index and the deflator, respectively, were:

$$\sigma_{mav} = .24 + .30\, E_{mav}$$
$$(1.03) \quad (7.21)$$
$$\bar{R}^2 = .94;\ \text{SEE} = .17;\ \text{DW} = 1.95;\ \text{rho} = .72.$$

and

$$\sigma_{mav} = .22 + .27\, E_{mav},$$
$$(2.37) \quad (13.40)$$
$$\bar{R}^2 = .96;\ \text{SEE} = .12;\ \text{DW} = 1.66;\ \text{rho} = .41.$$

where $\sigma_{mav}$ is a six-year moving standard deviation and $E_{mav}$ is a six-year moving average of inflation. For conclusions reached by Klein for the postwar period, see footnote 11.

### Measuring the gains from lowering inflation

If uncertainty about inflation is positively associated with its level, then reducing inflation should also reduce uncertainty, stimulate employment and investment, and raise output. Is it possible to quantify this? To do so with any great confidence is difficult. Recently published studies, however, do allow some rough estimates. Neither the linkage between inflation and uncertainty nor that between uncertainty and economic performance is likely to be precisely estimated or highly stable, but the following calculations are of interest.

Mullineaux, who also uses the standard deviation from the Carlson data in measuring the impact of inflation variability on unemployment, presents results suggesting that a unitary increase in this standard deviation produces a 1- to 2-percentage-point increase in unemployment over a two-year period.[21] If the coefficient estimated in our equation 5 is any guide to the relationship between the existing inflation rate and the standard deviation of inflation forecasts, then bringing inflation down about 10 percent could result in a unitary reduction in the standard deviation, lowering unemployment by 1 to 2 percentage points.

Levi and Makin have estimated the impact of inflation uncertainty, measured in this fashion, on the percentage change in total nonagricultural employment. They find that over the 1965-75 period, a unitary increase in the standard deviation of inflation forecasts lowers employment by 2.25 percent.[22] Likewise, if a 10-percent reduction in inflation caused a unitary reduction in the standard deviation, employment could rise by 2.25 percent. Therefore, there is considerable scope for substantial gains from measurable progress against inflation.

### Conclusion

This article has provided empirical support for the existence of a positive relationship between inflation and economic uncertainty in the United States. Since this uncertainty can reduce economic activity and misallocate resources in the economy, the incentive for lowering inflation is clear.

We have not been able to isolate a tight enough correspondence between inflation and uncertainty to be able to say with great accuracy what the reduction in uncertainty would be for a marginal decline in inflation of, say, 2 or 3 percentage points. And for the ultimate impact on the economy, we also must await more conclusive evidence on how much effect the reduced uncertainty itself has in increasing real economic variables. If the long-run gains from reducing inflation are balanced against the transitional costs, however, a strong case can be made for bearing the costs in order to restore a noninflationary environment.

21. See "Unemployment, Industrial Production, and Inflation Uncertainty," p. 166.

22. See "Inflation Uncertainty and the Phillips Curve," p. 1025.

**New Member Banks**

Northway National Bank, Addison, Texas, a newly organized institution located in the territory served by the Head Office of the Federal Reserve Bank of Dallas, opened for business June 1, 1981, as a member of the Federal Reserve System. The new member bank opened with capital of $1,500,000 and surplus of $1,500,000. The officers are: Charles A. Richardson, Chairman of the Board; David M. Bernardin, President; Joe Key, Senior Vice President; and Vickie Edgar, Cashier.

Citizens National Bank–West, Houston, Texas, a newly organized institution located in the territory served by the Houston Branch of the Federal Reserve Bank of Dallas, opened for business June 1, 1981, as a member of the Federal Reserve System. The new member bank opened with capital of $1,000,000 and surplus of $1,000,000. The officers are: W. Phillip Johnson, Jr., Chairman of the Board; Jimmy G. Cox, President; and Michael L. Burnett, Vice President and Cashier.

Frontier National Bank, Round Rock, Texas, a newly organized institution located in the territory served by the San Antonio Branch of the Federal Reserve Bank of Dallas, opened for business June 1, 1981, as a member of the Federal Reserve System. The new member bank opened with capital of $750,000 and surplus of $750,000. The officers are: Mark J. Silverstone, Chairman of the Board; Bob E. Lively, President; and Gary P. Bowles, Cashier.

RepublicBank Post Oak, N.A., Houston, Texas, a newly organized institution located in the territory served by the Houston Branch of the Federal Reserve Bank of Dallas, opened for business June 8, 1981, as a member of the Federal Reserve System. The new member bank opened with capital of $1,250,000 and surplus of $1,250,000. The officers are: Joe M. Bridges, Chairman of the Board; Bob Pizzitola, President and Chief Executive Officer; Bob Shaw, Vice President; Bonnie Basham, Cashier; and Karin Andrews, Administrative Officer.

Metropolitan National Bank, Farmers Branch, Texas, a newly organized institution located in the territory served by the Head Office of the Federal Reserve Bank of Dallas, opened for business June 15, 1981, as a member of the Federal Reserve System. The new member bank opened with capital of $1,500,000 and surplus of $1,500,000. The officers are: James A. Moran, Chairman of the Board; Roland Walden, President; Wendell C. Howie, Vice President and Cashier; Loretta S. Phillips, Assistant Vice President; and Sallie Lundy, Assistant Cashier.

# "Fed Quotes"

**Brief Excerpts from Recent Federal Reserve Speeches, Statements, Publications, Etc.**

"The habit of taking a long-run view of things, I believe, has much diminished in recent years. This seems apparent from the way in which we have allowed the growth of our economy to lag for the sake of immediate satisfactions. We have increased consumption and reduced savings and therewith investment in future productivity. We have been hesitant to come to grips with the problem of inflation which beclouds our future because of the fear of temporary pain from the actions needed. We have treated ourselves to 'entitlements' of all sorts without providing the means of paying for them. And in our business functions, we have laid ourselves open to the charge that our habit of focusing on the profits of the next quarter makes us vulnerable to being overtaken by more long-run oriented competitors like the Japanese."

"We already see many of the consequences of past neglect—in the form of our inflation, declining productivity, and uncertainty about future supplies of oil and other resources. We see them in the way we are being overtaken economically by other countries and in the way in which our influence in the world has diminished. We are now experiencing the long-run consequences of the many short-run expediencies resorted to in the past. Having too often chosen the easy way, all future options are becoming harder and less inviting.

"I do not believe that this must be a lasting condition. We can learn from past mistakes. American society, I believe, is particularly capable of that kind of learning. . . . It is based on the ability to analyze, to see current problems in the light of general principles, the ability to take a long view. . . .

"If we are willing to take that kind of a look at where we have been, where we are, and where we should be going, we shall be able to make progress in many directions. We can end our inflation, raise the output of our economy, and make our future more secure. We can improve our society and the quality of our life at home and strengthen our role abroad and contribute to the peace and progress of the world. These gains will not always come cheaply. They will require sacrifices in the short run. But, over the years, this investment will pay off. Indeed, if we do not make the sacrifices and invest in our future, then the ultimate cost in terms of living standards and quality of life will be far higher."

Henry C. Wallich, Member, Board of Governors of the Federal Reserve System (At the Commencement Exercises, Washington College, Chestertown, Maryland, May 17, 1981)

# Regulatory Briefs and Announcements

## Regulations T and U: Board Adopts Amendment, Publishes Proposed Amendments

The Board of Governors of the Federal Reserve System has recently amended Regulation T (Credit by Brokers and Dealers) and has published for comment proposed amendments to that regulation and Regulation U (Credit by Banks for the Purpose of Purchasing or Carrying Margin Stocks).

The adopted amendment deleted the paragraph permitting the use of foreign currency in a margin account. Deletion of this paragraph in Regulation T is intended to make it clear that speculative holding of foreign currency in a margin account is not permissible and that any transactions in foreign currency should be effected in accounts insulated from securities credit transactions.

The first two proposed amendments to Regulation T concern margin requirements for trading of options on government and government agency debt issues. The Securities and Exchange Commission recently approved trading on the Chicago Board Options Exchange in option contracts on Government National Mortgage Association (GNMA) securities. The New York Stock Exchange, the American Stock Exchange, and the Chicago Board Options Exchange have proposed trading in option contracts on Treasury bills, notes, and bonds. The proposed amendments would affect margin requirements in option contracts on such securities.

Under one proposed amendment, brokers and dealers would be allowed to give "good faith" loan value to an option that has been purchased, and a "good faith" margin would be permitted when an option contract is written. The maintenance margin requirements that the individual securities exchanges set for their members, subject to review by the Securities and Exchange Commission, would be expected to apply.

The alternative proposed amendment would set a uniform margin requirement of 130 percent of the option premium plus $1,000 for the initial writing of all uncovered option contracts on exempt debt securities. Under this amendment, no option contract would be permitted to have loan value. Exchanges would continue to be free to set maintenance margin requirements. Under either proposal, no margin would be required where the option is covered as specified by the Board.

In the absence of an amendment, the Board's current margin rules relating to options on corporate equity securities would apply to options on government debt issues. The current margin requirement—30 percent of the value of the underlying security, with additional adjustment for unrealized losses and gains—would impair the usefulness of these contract markets, since the underlying securities can be purchased, under current industry practice, on a much lower margin.

The Board has asked specifically for comments regarding the likelihood that with the "good faith" approach, the exchanges would set different margin requirements on the same or similar option contracts; the denial of any loan value to a long contract; Board specification of an initial margin requirement; and the appropriateness of the Board's proposed margin for options on all exempt debt securities.

Subsequent proposed amendments concern both Regulation T and Regulation U. These proposed

amendments are the first steps in a review by the Board intended to simplify and modernize all Federal Reserve margin regulations, reducing the burden of regulatory compliance wherever possible.

For Regulation T the Board proposed to eliminate "equity building" devices; consolidate the bond accounts with the General Account; and require, in certain circumstances, an offsetting adjustment to any highly leveraged General Account by transfers from the customer's Special Miscellaneous Account. The Board also proposed to relax the restriction on the arranging of credit by investment bankers to permit investment banking services that may otherwise be prohibited.

For Regulation U the Board proposed to change the collateral test so as to exempt from quantitative limitation all bank credit not secured by margin equity securities.

Comments on the first two proposed amendments must be received by August 3, 1981, and should refer to Docket No. R-0082. Comments on the other proposed amendments must be received by September 15, 1981, and should refer to Docket No. R-0362. All should be submitted to the Secretary, Board of Governors of the Federal Reserve System, 20th Street and Constitution Avenue, N.W., Washington, D.C. 20551.

## Banking Institutions Allowed to Establish International Banking Facilities

The Federal Reserve Board has amended its regulations regarding reserve requirements and payment of interest on deposits to permit the establishment of international banking facilities (IBFs) in the United States. It is believed that the establishment of IBFs at U.S. banking offices will enhance the international competitive position of banking institutions in this country.

Subject to conditions specified by the Board, IBFs may be established by U.S. depository institutions, Edge Act and Agreement corporations, and U.S. branches and agencies of foreign banks. In general, an IBF may accept deposits from and extend credit to foreign residents or other IBFs. Regulation D reserve requirements and Regulation Q interest rate limitations are not applicable to such funds.

The Board made its action effective December 3, 1981, in order to give all interested banking institutions time to make necessary arrangements for implementation of IBFs.

The Board has made a general statement of policy regarding the use of IBF deposits and IBF loans. The policy states, in part, that with respect to nonbank customers located outside the United States, the Board expects IBFs to accept only deposits that support a customer's operations outside the United States and to extend credit only to finance the customer's non-U.S. operations.

Moreover, deposits should not be used as a means of circumventing interest rate restrictions or reserve requirements. The Board specifies that this policy be communicated in writing to IBF nonbank customers when a credit or deposit relationship is initially established. The IBFs are also required to obtain acknowledgement of receipt of the notice from nonbank customers that are foreign affiliates of U.S. residents at the time the credit or deposit relationship is established with an IBF.

Advances by an IBF to U.S. offices of its parent institution will be subject to the reserve requirement on Eurocurrency liabilities of the U.S. office in the same manner as advances from a foreign office to its U.S. office. An IBF will be subject to the same examination and supervisory procedures as apply to other operations of its parent institution.

## Regulation Y: Board Confirms Rule on Real Estate Appraisals by Bank Holding Companies

The Board of Governors of the Federal Reserve System has confirmed its decision to amend Regulation Y (Bank Holding Companies and Change in Bank Control) by adding the performance of real estate appraisals, including single-family residences, to the list of permissible nonbanking activities in which bank holding companies may engage.

Although the amendment became effective December 31, 1980, comments were solicited until January 15, 1981, because the Board had modified the original proposal by including appraisals of single-family residences in the final rule. The final rule was confirmed June 10, 1981.

# Now Available

Recently issued Federal Reserve circulars, speeches, statements to Congress, publications, etc., may be obtained by contacting the Department of Communications, Financial and Community Affairs, Federal Reserve Bank of Dallas, Station K, Dallas, Texas 75222, unless indicated otherwise. Requests for circulars should specify the circular numbers.

## Circulars

**Iranian Assets Control Regulations: Amendments.** 30 pp. Circular No. 81-110 (June 3, 1981).

**Regulations D [Reserve Requirements of Depository Institutions] and Q [Interest on Deposits]: Amendment.** 5 pp. Circular No. 81-115 (June 8, 1981).

**Policy Statement: Sale of Third Party Commercial Paper.** 7 pp. Circular No. 81-117 (June 11, 1981).

**Regulation Z—Truth in Lending: Revised Regulation Z; Technical Amendments; Proposed Official Staff Interpretation for Regulation Z Commentary.** 5 pp. Circular No. 81-118 (June 12, 1981).

**Rules of Organization, Rules of Procedure: Revised Pamphlet.** 13 pp. Circular No. 81-119 (June 12, 1981).

**Regulations Z [Truth in Lending] and M [Consumer Leasing] Pamphlets.** 143 pp. Circular No. 81-121 (June 16, 1981).

**Regulation T [Credit by Brokers and Dealers]: Amendment to Delete Provision Permitting Use of Foreign Currency in a Margin Account.** 3 pp. Circular No. 81-122 (June 18, 1981).

**Iranian Assets Control Regulations: Amendments.** 3 pp. Circular No. 81-124 (June 22, 1981).

**A Reminder Concerning Attempts to Perpetrate Fraudulent Transfers of Funds.** 2 pp. Circular No. 81-125 (June 23, 1981).

**Reclassification of Member Banks for Electoral Purposes.** 1 p. Circular No. 81-126 (June 25, 1981).

**Iranian Assets Control Regulations: Amendments.** 7 pp. Circular No. 81-127 (June 26, 1981).

**Regulation Y—Bank Holding Companies and Change in Bank Control: Affirmation of Final Rule Relating to Real Estate Appraisals by Bank Holding Companies.** 1 p. Circular No. 81-128 (June 26, 1981).

## Speeches and Statements

Remarks by **Henry C. Wallich ("LDC Debt—To Worry or Not to Worry")** at the **59th Annual Meeting of the Bankers' Association for Foreign Trade,** Boca Raton, Florida. 16 pp., including summary. June 2, 1981.

Statement by **J. Charles Partee** before the **Subcommittee on General Oversight and Renegotiation** of the Committee on Banking, Finance and Urban Affairs, U.S. House of Representatives. 8 pp. June 4, 1981.

Remarks by **Lyle E. Gramley** at the **47th Annual Session of The Stonier Graduate School of Banking,** New Brunswick, New Jersey. 12 pp. June 11, 1981.

Statement by **Frederick H. Schultz** before the **Subcommittee on Conservation, Credit, and Rural Development** of the Committee on Agriculture, U.S. House of Representatives. 11 pp., including charts. June 23, 1981.

Statement by **Paul A. Volcker** before the **Subcommittee on Domestic Monetary Policy** of the Committee on Banking, Finance and Urban Affairs, U.S. House of Representatives. 20 pp. June 25, 1981.

## Pamphlets, Brochures, and Reports

**A Citizen's Guide to CRA.** Published by the Federal Financial Institutions Examination Council. (For use by those who wish to comment on applications subject to the Community Reinvestment Act of 1977 filed with the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation, the Federal Home Loan Bank Board, or the Office of the Comptroller of the Currency) 39 pp. January 1981.

**Through the Discount Window at the Federal Reserve.** Published by the Federal Reserve Bank of Dallas. (Describes the programs under which Federal Reserve credit is extended and explains the process used in extending such credit to depository institutions) 8 pp. May 1981.

**Pamphlet announcing Consumer and Community Affairs Handbook.** Issued by the Board of Governors of the Federal Reserve System. (Describes a new looseleaf service of the Federal Reserve Board and includes an order form) 4 pp. June 1981.