On Disinflation since 1982: An Application of Change-Point Tests

by Edward Bryden and John B. Carlson

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Introduction

On October 6, 1979, the Federal Open Market Committee of the Federal Reserve System embarked on an aggressive policy to lower the inflation rate, which then stood near 12 percent. That effort succeeded: By the mid-1980s, the rate of change in the Consumer Price Index (CPI) was reduced to less than 4 percent on a three-year moving-average basis, as shown in figure 1. The commonly reported measure of core inflation — the CPI less food and energy— also fell substantially. Since then, both inflation measures have been relatively stable, ranging between 3 and 5 percent for the CPI and between 4 and 5 percent for the CPI less food and energy. In the most recent three-year period, however, both measures have fallen to rates not seen since the mid-1960s.[1]

The behavior of inflation since the early 1980s evokes some interesting policy questions. Has inflation stabilized around some particular rate over the long term? Or will it be even lower in the 1990s, as the recent pattern in core inflation suggests? Moreover, how can one account for the relative stability of inflation in the face of the increased variability of money growth since 1980?

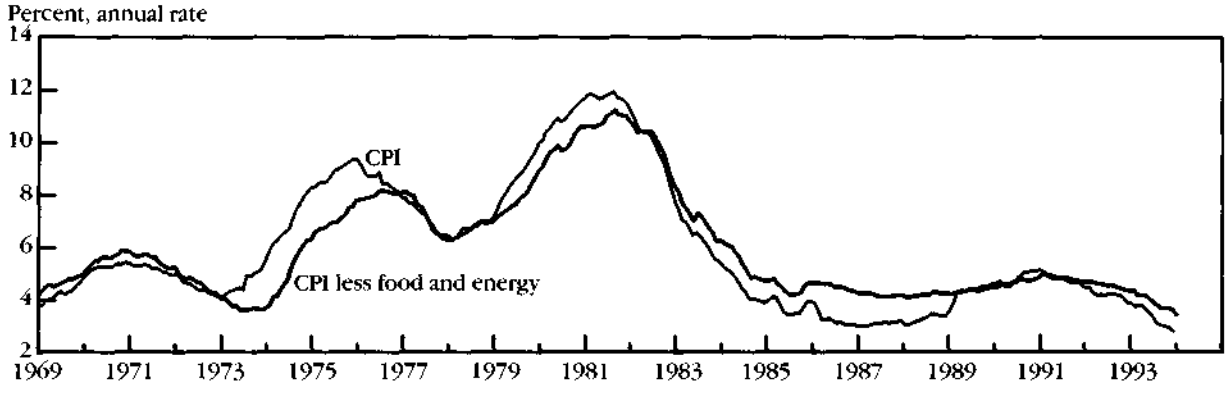
As an initial investigation into these issues, we examine more closely some recent changes in the univariate properties of alternative measures of core inflation. The data indicate that autocorrelation dropped sharply for all core measures after 1982. Indeed, for long periods, core inflation appears to behave as though it is generated by a process with a fixed mean and serially independent error term. Our chief purpose is to identify and explain periods over which the core measures exhibit such stationarity.

To address the question of whether disinflation has continued into the 1990s, we take an agnostic approach. Because the measures of core inflation appear to be essentially unchanged over long periods, we apply nonparametric tests suggested by Lombard (1987) to identify statistically significant change points in the distribution of inflation since 1982. If inflation has stabilized, then we would not expect to find any change in the distribution. Our results indicate that for all three core measures considered, permanent changes in the inflation

■ **1** Although CPI inflation dipped to around 1 percent in 1986 on a 12-month moving-average basis, this is widely viewed as a consequence of the transitory weakness in oil prices.

FIGURE 1

Inflation: Three-Year Moving-Average Basis



SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

rate have been infrequent and, for the most part, rather abrupt.

Although our approach does not rely on a particular structural context, the findings offer a benchmark against which structural results may be compared. Moreover, we are encouraged by the fact that the change points identified are coincident with economically significant events such as the onset and victory of the Persian Gulf War. We contend that such events may be watersheds of change in price-setting behavior; hence, we argue that change-point analysis may well be useful for detecting the timing of "permanent" changes in the rate of inflation.

The paper proceeds as follows: The next section introduces the concept of core inflation as developed by Bryan and Cecchetti (1993). We describe their measures and present an overview of the behavior of core inflation since 1982. The statistical framework we employ in testing for change points is outlined and the results are presented and discussed in section II. Although we offer no structural analysis, our findings have important implications for the current inflation rate. These implications are developed in section III, along with suitable caveats.

I. Core Inflation

Core inflation measures are generally designed to extract the long-run or permanent component of the measured price index by filtering out transitory elements of inflation.[2] For example, food and energy components of the CPI are subject to periodic supply shocks that produce relatively large but transitory (although sometimes persistent) changes in the CPI that are unrelated to more permanent changes. Although food and energy are among the more volatile components of the CPI, other comparably volatile components are not excluded; thus, the CPI excluding food and energy is somewhat arbitrary.

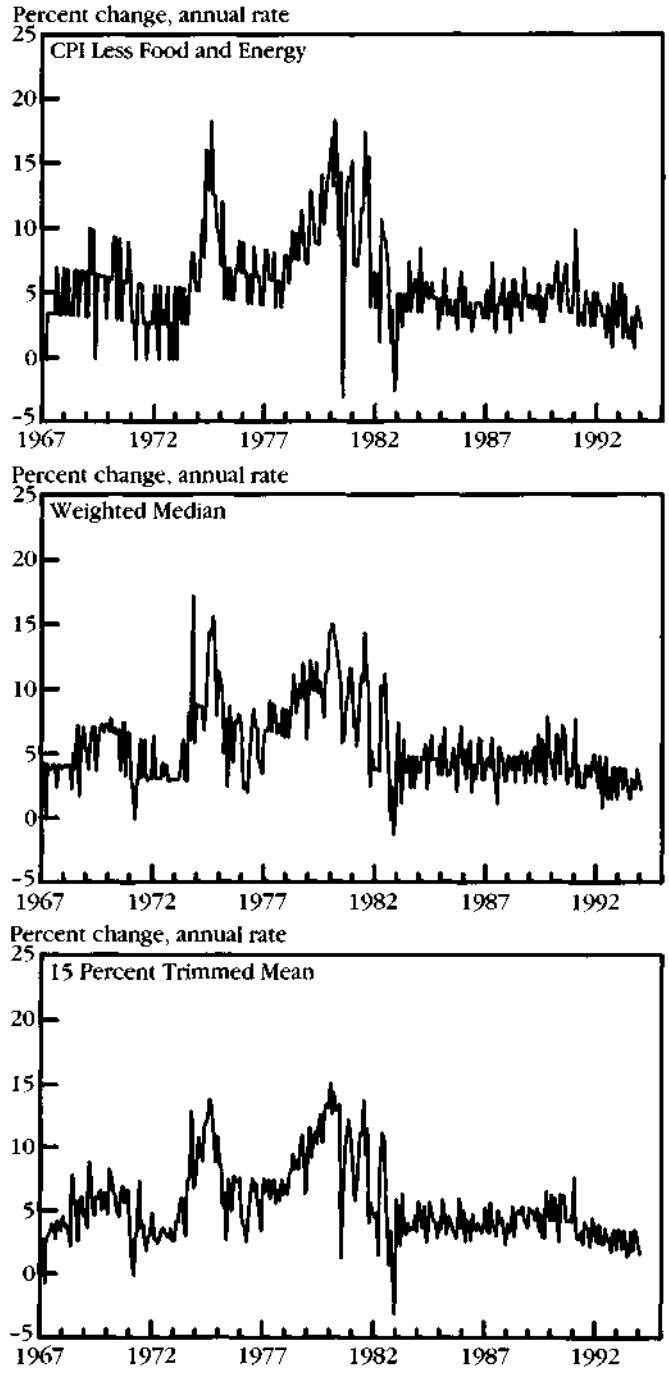
Alternative measures of core inflation suggested by Bryan and Cecchetti (1993) do not preselect any particular sectors for exclusion. Rather, their estimators are calculated by trimming the outlying portions of the cross-sectional distribution of the component parts of aggregate price indices in each month. Thus, these "limited-influence" estimators do not single out any specific sectors as the primary source of transitory noise for all periods.

Among this class of measures, Bryan and Cecchetti consider two particular estimators: the weighted median and the 15 percent trimmed mean. Both are computed using the fixed 1985 CPI expenditure weights as proximate measures of the number of prices in each category. More precisely, when computing the histogram for inflation, the weights are treated as the percentage of the distribution of all prices that experience the amount of inflation reported for that category. The weighted median

■ 2 In defining core inflation, Bryan and Cecchetti use the term *persistent* component of inflation as opposed to the permanent component. Because their example treats core inflation as an equilibrium concept determined solely by money growth, and since they operate in a single-period context, we believe the term *permanent* is more accurate

FIGURE 2

Monthly Change in Core Inflation Measures, 1967–92



SOURCES: U.S. Department of Labor, Bureau of Labor Statistics; and the Federal Reserve Bank of Cleveland.

is measured as the central point, as implied by the CPI expenditure weights, in the cross-sectional histogram of inflation each month. The 15 percent trimmed mean, which is the weighted average of the central 85 percent of the price-change distribution, was chosen because it had the smallest monthly variance of all trimmed estimators of this type.[3]

Figure 2 contrasts monthly changes in the weighted median and the 15 percent trimmed mean with the CPI excluding food and energy. Although the general patterns are the same since 1967, the alternatives proposed by Bryan and Cecchetti exhibit less variability, especially the 15 percent trimmed mean, which has a variance of around 1 percent after 1982. What is noteworthy is that all three series appear to have shifted downward sometime around the beginning of 1991. Within each of these subperiods, the core measures appear to be stationary and serially independent. We are thus motivated to look more closely at their time-series properties since 1982.

II. Univariate Properties of Core Inflation Measures

Figure 3 illustrates the substantial change in autocorrelation in core inflation measures before and after January 1983. The persistence of shocks, so evident in the earlier period, is virtually absent after 1982.[4] When dividing the latter period at the beginning of 1991, we find

■ 3 Bryan and Cecchetti also deal explicitly with conceptual issues. They note that although the term *core inflation* enjoys widespread use, it appears to have no clear definition. They argue that general usage of the term implies that it is tied in some way to money growth. Thus, excluding transitory components from the price index should result in a measure of monetary inflation.

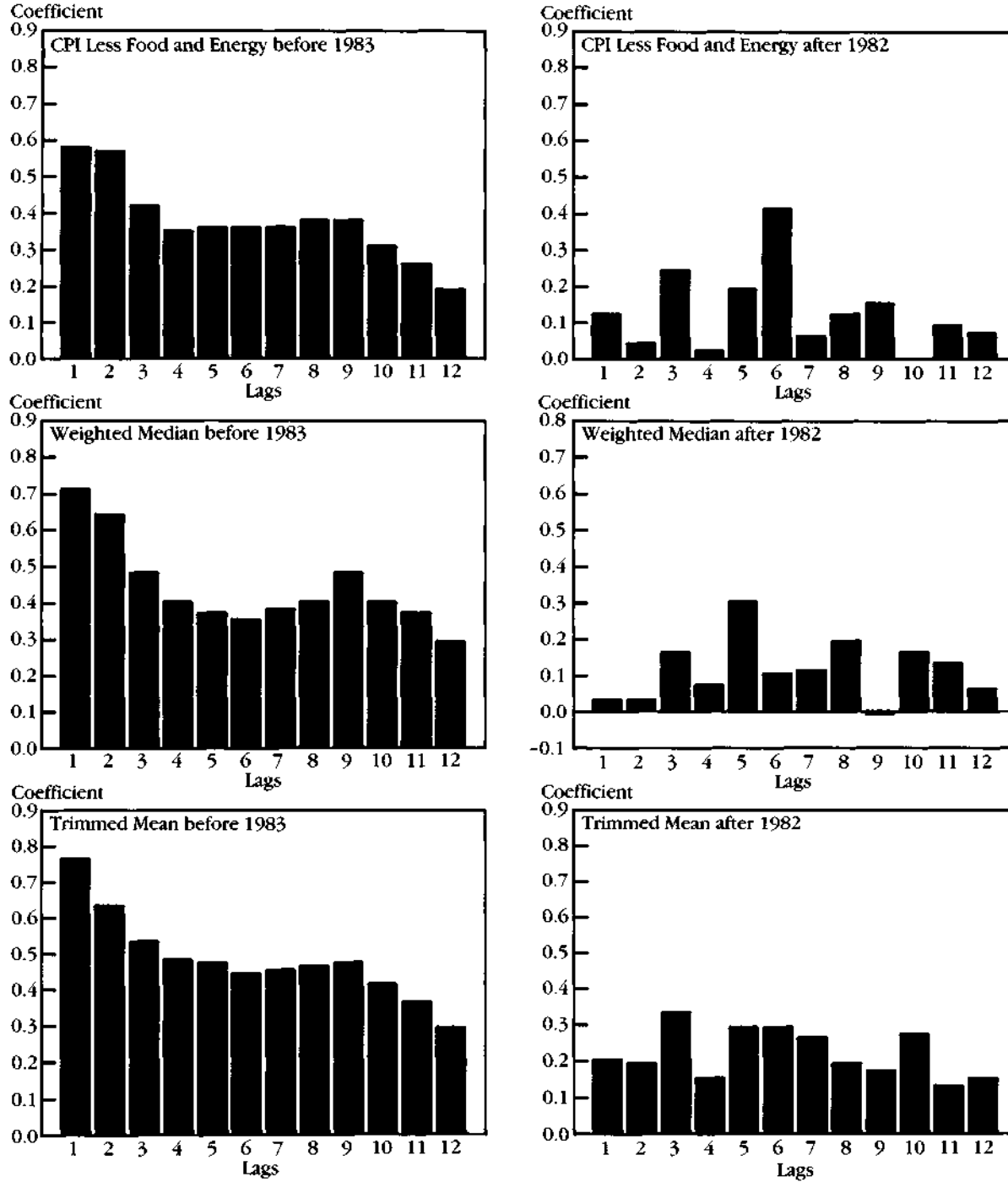
However, as Bryan and Cecchetti stress, a clear definition of core inflation necessarily requires a model of how prices and money are determined in the economy. Any such formal structure is difficult to formulate and easy to criticize, so they offer an illustrative example to highlight some desirable features for core measures. In this example, the money growth rate is the sole determinant of core inflation. Velocity is assumed to be constant.

Under assumptions of asymmetric supply disturbances, with costly price adjustment, they show that the observed skewness in the cross-sectional distribution of inflation can cause substantial noise in the aggregate CPI at high frequencies. Moreover, in this framework they can demonstrate that limited-influence estimators provide superior short-run measures of core (monetary) inflation. They also document that their estimates of inflation have a higher correlation with past money growth and provide improved forecasts of future inflation relative to the CPI.

■ 4 It is useful to note that the method for calculating the CPI housing component was changed around this time. Given that this component accounts for more than a third of the total measure, the change itself could explain some of the difference in time-series properties.

FIGURE 3

Autocorrelation Function of Core Inflation Measures



SOURCE: Authors' calculations.

TABLE 1

First-Order Serial Autocorrelation

Measure	Sample Period: January 1983–December 1990	Sample Period: January 1991–December 1993
CPI	0.4278[a]	−0.1743
CPI less food and energy	−0.0804	0.2783
Weighted median	−0.1304	−0.2033
15 percent trimmed mean	−0.0767	0.0508

a. Significantly different from zero at the 5 percent confidence level.
SOURCE: Authors' calculations.

BOX 1

Change-Point Test Methodology

Lombard (1987) has proposed several procedures to test for change points in the following context. Consider a sequence of independent random variables, $x_1, ..., x_T$ with continuous distribution functions $F(x, \theta_1), ..., F(x, \theta_T)$. The series has a change point at τ if $\theta_1 = ... = \theta_\tau = \theta$, while $\theta_{\tau+1}, ..., \theta_T$ differ from the unknown θ in some way. Since some procedures may be sensitive to distributional specifications, Lombard (1987), Pettitt (1979), and others have proposed nonparametric tests that are robust against deviations from tentative distributional assumptions. Essentially, data are replaced by the ranks of their magnitudes (or functions of these ranks), enabling "distribution free" tests of the null hypothesis of no change.

It is often more realistic to assume that a change occurs smoothly over a period of time rather than abruptly. For this purpose, Lombard considers a smooth change specification:

$$\theta_i = \begin{cases} \xi_1 & (i \le \tau_1), \\ \xi_1 + (i - \tau_1)(\xi_2 - \xi_1)/(\tau_2 - \tau_1) & (\tau_1 < i \le \tau_2), \\ \xi_2 & (i > \tau_2), \end{cases}$$

where ξ_1, ξ_2, τ_1, and τ_2 are unknown. Note that the abrupt-change model is a special case where $\tau_2 = \tau_1 + 1$. Moreover, an onset of a trend is a special case characterized by $\tau_2 = T$ and $\tau_1 < \tau_2 - 1$.

Lombard derives rank test statistics of H_0: $\xi_1 = \xi_2$ against hypotheses of one, two, and three abrupt changes, smooth change, and an onset of a trend. He also provides a table of significance points for each of these test statistics based on asymptotic null distributions. Asymptotic significance points are shown to be applicable when sample sizes are at least 30. A method for estimating both τ_1 and τ_2 is also provided.

little or no evidence of positive first-order serial correlation in the core measures in either of the subperiods; indeed, the estimated first-order correlation coefficients of the median or 15 percent trimmed mean are negative, albeit statistically insignificant (see table 1). It is interesting to note, however, that the CPI exhibits significant serial correlation in the January 1983 to December 1990 period, but not afterward. This probably reflects the impact of the transitory but somewhat persistent drop in oil prices from 1985 to 1986 that seemed to dominate CPI inflation but not core inflation (see figure 1).

To address the question of whether trend inflation has fallen in the 1990s, we apply nonparametric change-point tests proposed by Pettitt (1979) and Lombard (1987). Essentially, these procedures test the null hypothesis that a time series is drawn from a distribution having an unchanged mean. A change point essentially identifies a month after which the series mean changes. All test procedures assume serial independence, a condition satisfied by both the median and 15 percent trimmed mean.

The Pettitt procedure formulates a test statistic for a single (abrupt) change point; it also estimates a probable change-point date. Lombard proposes test statistics for the existence of one change point, multiple change points, smooth changes, and an onset of a trend. For abrupt change points, the Lombard procedure uses a heuristic approach: A series change point is identified when a cumulative rank score exhibits a pronounced and sustained change in direction (see box 1). We use the Pettitt estimate for identifying abrupt change-point dates. When a smooth (continuing) change is indicated, the Lombard procedure provides estimates for the beginning and ending points.

The test results, presented in table 2, indicate that core inflation measures were stationary over substantial periods during the 1980s. That is, over periods as long as eight years, core inflation was essentially impervious to other economic events. If any systematic effects occurred, presumably they were offsetting.

The test results are most dramatic for the 15 percent trimmed mean, confirming one or more series breaks since 1982. The Pettitt procedure indicates that the most likely change point occurred between January and February 1991.[5] Lombard test statistics reveal multiple change points — as many as three over the

5 Here, we adopt the convention that the break-point month is the last month of the former series.

TABLE 2

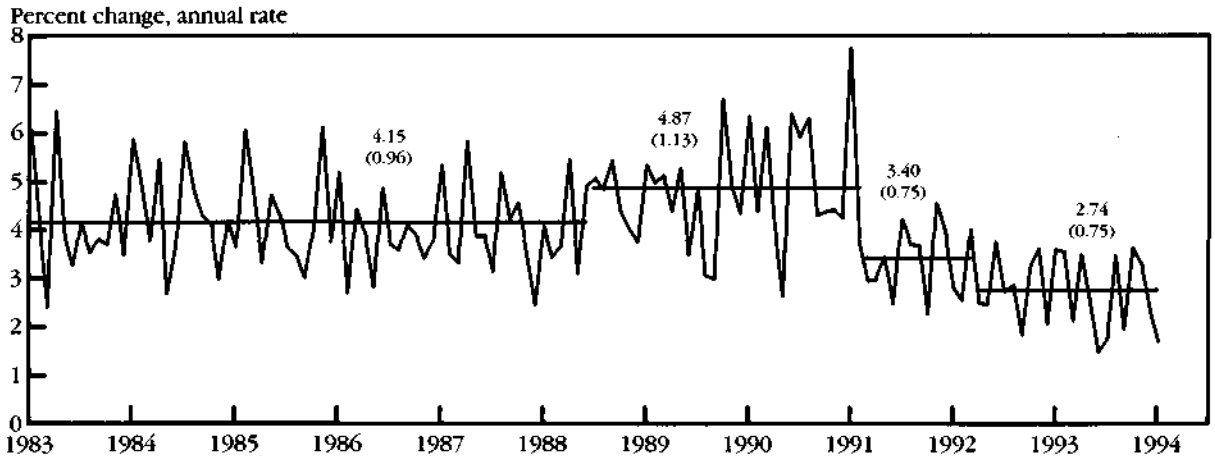
Change-Point Test Results

				Lombard Test Statistics				
		Pettitt Statistics		Number of Change Points				
Measure	Sample	Z	Date	One	Two	Three	Trend	Smooth
Trimmed mean	Jan. 1983–Jan. 1994	6.201469[a]	Jan. 1991	1.791591[a]	2.139584[a]	0.770881[a]	0.608218[a]	0.138368[a]
	Jan. 1983–Jan. 1991	3.283853[a]	May 1988	0.607060[a]	0.683709[a]	0.240834[a]	0.201422[a]	0.051301[a]
	Jan. 1983–May 1988	**1.401437**	**June 1985**	**0.145309**	**0.130436**	**0.045509**	**0.041794**	**0.013277**
	June 1988–Jan. 1991	**1.302128**	**Sept. 1989**	**0.064473**	**0.089653**	**0.035695**	**0.011791**	**0.003384**
	Feb. 1991–Jan. 1994	2.482423	March 1992	0.615216[a]	0.546649	0.171301	0.174561[a]	0.060578[a]
	Feb. 1991–March 1992	**0.993333**	**June 1991**	**0.043076**	**0.079633**	**0.029932**	**0.002808**	**0.001200**
	April 1992–Jan. 1994	**1.402339**	**April 1993**	**0.130472**	**0.119259**	**0.043223**	**0.031432**	**0.010101**
CPI less food and energy	Jan. 1983–Jan. 1994	4.361086[a]	Feb. 1991	0.996035[a]	1.051311[a]	0.381942[a]	0.327599[a]	0.075705[a]
	Jan. 1983–Feb. 1991	**2.092511**	**Feb. 1988**	**0.334410**	**0.553035**	**0.221737**	**0.066939**	**0.013824**
	March 1991–Jan. 1994	2.744248[a]	April 1992	0.908470[a]	0.827892[a]	0.255431[a]	0.269128[a]	0.090047[a]
	March 1991–April 1992	**1.405528**	**Sept. 1991**	**0.116254**	**0.147022**	**0.052344**	**0.018456**	**0.006603**
	May 1992–Jan. 1994	2.353672	May 1993	0.446918[a]	0.348901	0.104977	0.124092	0.042628[a]
Median	Jan. 1983–Jan. 1994	4.694689[a]	Jan. 1991	1.283018[a]	1.461698[a]	0.499620[a]	0.453666[a]	0.112148[a]
	Jan. 1983–Jan. 1991	**1.486857**	**Sept. 1989**	**0.064562**	**0.066373**	**0.027522**	**0.016832**	**0.003710**
	Feb. 1991–Jan. 1994	2.385073	March 1992	0.428849	0.423835	0.139890	0.118737	0.040678[a]
	Feb. 1991–March 1992	**1.660001**	**June 1991**	**0.170773**	**0.201458**	**0.070506**	**0.022328**	**0.011380**
	April 1992–Jan. 1994	**1.126164**	**May 1993**	**0.076230**	**0.124559**	**0.047927**	**0.008267**	**0.002577**

a. Significant at the 5 percent confidence level.
NOTE: Lines highlighted in blue indicate periods with no evidence of change in distribution.
SOURCE: Authors' calculations.

FIGURE 4

15 Percent Trimmed Mean, 1983–93



NOTE: Numbers appearing above solid rules indicate averages for the period shown. Numbers in parentheses represent standard deviations.
SOURCE: The Federal Reserve Bank of Cleveland.

whole period. The cumulative rank score peaks around January, confirming the Pettitt estimate of a probable change-point date. The Lombard procedure also indicates a possible smooth change. However, the procedure estimates for beginning and ending dates of smooth change are in adjacent months of January and February 1991, and hence corroborate the Pettitt change-point date.

Applying the same battery of tests to the data prior to February 1991 indicates another statistically significant change point, which according to the Pettitt procedure occurred in May 1988. Although the Lombard procedure corroborates the existence of an abrupt change point in that month, the test statistics for the onset of trend and smooth change are also significant. Inspection of the cumulative rank scores indicates an unambiguous turnaround in May 1988, corroborating other evidence of an abrupt change point in that month.

Applying the tests to further subperiods of the series reveals no other statistically significant change points. Thus, we conclude that the data in the periods from January 1983 to May 1988 and from June 1988 to January 1991 are from homogeneous groups.

Similarly, we find evidence of one abrupt change point after 1991. The Pettitt date indicates that this break occurred around April 1993.

The series change points are illustrated in figure 4. Average inflation rates (and standard deviations) within the homogeneous groups are also shown. Time-series methods proposed by Box and Jenkins (1970) indicate that the series is essentially white noise around a fixed mean. The autocorrelations of deviations of the 15 percent trimmed mean around its estimated trend levels are negligible (see the appendix).[6] Thus, as required by the Pettitt and Lombard tests, the assumption of serial independence is supported by the data. We conclude that inflation — as measured by the 15 percent trimmed mean — appears to have changed three times since 1982. Most noteworthy are the stability of this measure of core inflation within each of the four periods delineated by the change-point dates and the abruptness of the changes in inflation rates.

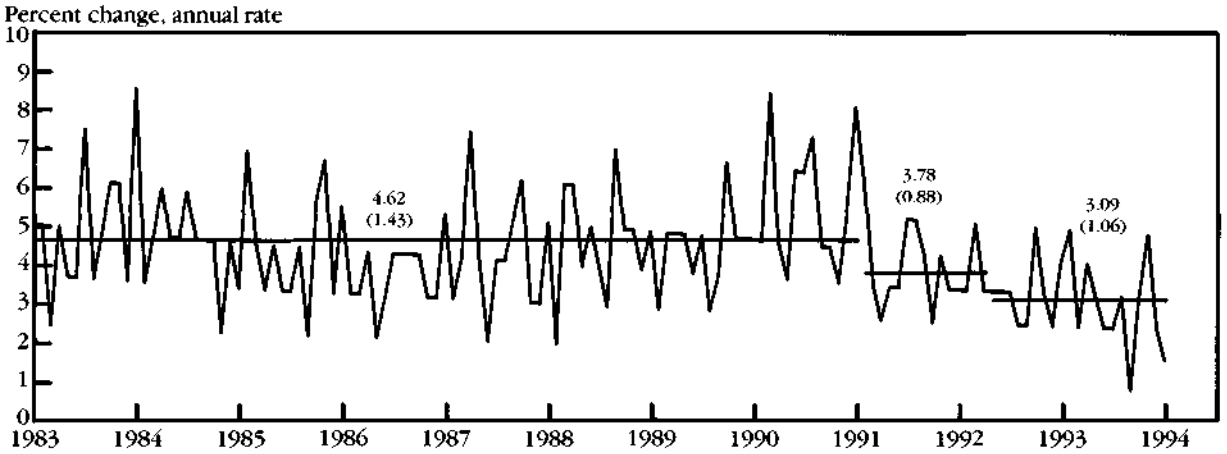
The test results for the CPI excluding food and energy are somewhat comparable, although they indicate a change point between February and March 1991, rather than between January and February 1991. Moreover, no significant change point is found in the sample prior to that date. However, the tests indicate another change point around the spring of 1992 comparable to the break found in the trimmed mean series. Although the Lombard test statistics are consistent with the existence of one change after April 1992, the Pettitt statistic is not. Given that little is known about the properties of the Lombard estimators for samples less than 30, we conclude that there is no break after April 1992.

The CPI less food and energy and its mean values within the three homogeneous groups are

6 The Box–Pierce portmanteau statistic for 12 lags is estimated to be 16.12, well below the critical value at the 5 percent significance level.

FIGURE 5

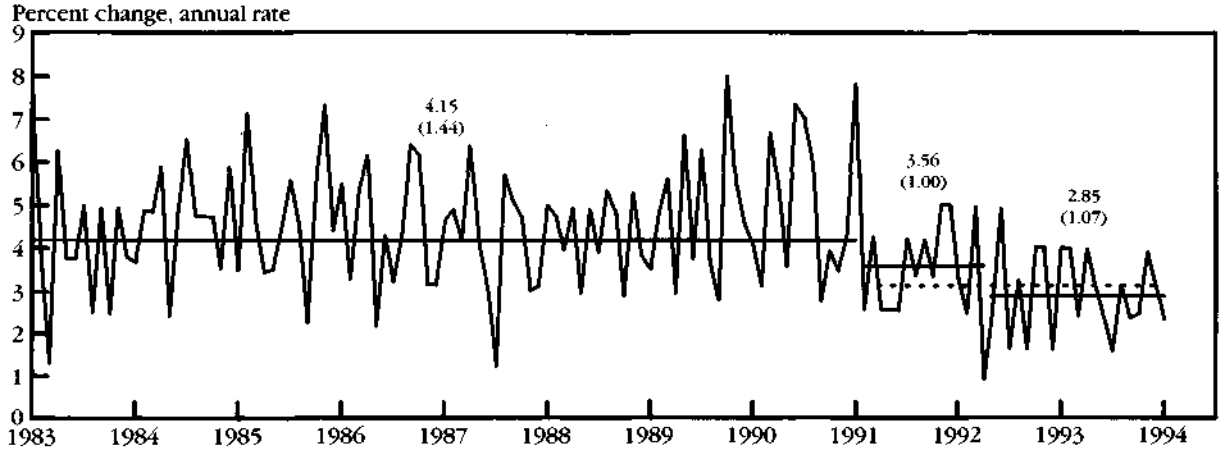
CPI Less Food and Energy, 1983–93



NOTE: Numbers appearing above solid rules indicate averages for the period shown. Numbers in parentheses represent standard deviations.
SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

FIGURE 6

Weighted Median, 1983–93



NOTE: Numbers appearing above solid rules indicate averages for the period shown. Numbers in parentheses represent standard deviations. Dotted line indicates trend after 1991 only.
SOURCE: The Federal Reserve Bank of Cleveland.

illustrated in figure 5. The autocorrelation function of deviations of this core inflation measure from its estimated trends is found in the appendix. Although there is some evidence of sixth-order autocorrelation, the coefficient is small and may reflect incomplete seasonal adjustment of the series, especially before 1990.[7] We conclude that there is not sufficient evidence of more persistent forms of autocorrelation.

The test results for the median CPI are mixed. Both Lombard and Pettitt procedures agree on the existence of a break between January and February 1991 and not in the prior period. After January 1991, the smooth-change statistic is significant, but beginning and ending points are in March and April 1992, consistent with an abrupt change. Inspection of the data (see figure 6) suggests a persistent if not permanent decrease in the inflation rate after this point.

■ 7 Individual components of the CPI are seasonally adjusted if they have historically exhibited a seasonal element. The seasonally adjusted CPI is a weighted average of components, some of which are seasonally adjusted. The aggregate index has tended to exhibit residual seasonality, raising questions about the validity of the method. Although a new seasonal adjustment procedure adopted in early 1994 has reduced residual seasonality, it has not completely eliminated the problem.

In light of this and the strong evidence of corresponding downward shifts in both the 15 percent trimmed mean and the CPI less food and energy, we are inclined to accept the hypothesis that the median inflation rate fell further in 1992.[8]

To summarize, several common properties emerge from this analysis. First, the tests performed on our measures indicate that the core inflation rate was surprisingly stable. During long periods over the last economic expansion, these measures behaved as though they were stationary processes with fixed means. The 15 percent trimmed mean series, however, suggests that inflation accelerated moderately, but rather abruptly, sometime around May 1988 and hovered around 4⅞ percent until early 1991. Neither of the other core measures exhibited a change point over the January 1983 to January 1991 period.

By early 1991, however, all series indicated that the core inflation rate declined substantially, again rather abruptly, and it may still be falling. The 15 percent trimmed mean and the CPI less food and energy tests suggest that inflation fell again around March 1992 to a rate below 3 percent. Although the median also appears to shift downward around this time, the statistical evidence is less compelling.

III. Interpretation of Results

Economists, as a rule, are reluctant to put much weight on univariate time-series results. After all, lending credence to univariate models is tantamount to admitting that economic theory is of little use. The absence of serial correlation, however, does have some interesting structural implications.

One obvious interpretation is that serial independence could be a manifestation of a systematic monetary policy that has effectively offset persistent or permanent shocks to inflation (at least for sustained periods). Under these circumstances, the stability of inflation in the 1980s could be the consequence of a reactive policy regime in which policy actions are based on deviations of inflation from a specified objective.

Such a regime would in principle require a well-defined, reliable model of the economy and a precise identification of policy objectives. The implied degree of understanding of such a system is surely beyond that which many policymakers would admit having. Furthermore, the Federal Open Market Committee (FOMC) does not choose an explicit objective for inflation. Although it reports the central tendency of members' expectations for inflation at the beginning of each year, these projections are not said to be policy *objectives*.

An alternative, and perhaps related, explanation for the serial independence of core inflation measures is that inflation expectations may play an important role in stabilizing month-to-month inflation rates. Inflation expectations themselves could have stabilized around lower rates because the Federal Reserve has established a consistent and credible policy of preventing persistent increases in inflation. Perhaps the central bank has done so by effectively anticipating and accommodating substantive shocks to money demand. Thus, although money growth — as measured by M2 — may have been quite variable over the last 10 years, its trend has been contained and even reduced.

To the extent that the FOMC has established a credible policy on inflation, price-setters are able to infer some inflation "norm." As long as policy remains consistent with that norm, price-setters have no basis for changing the prevailing set of expectations embodied in it; hence, the norm tends to act as a stabilizing force in price-setting.

The idea of a stable inflation norm is distinct from the expectations process embodied in popular forecasting models. These models, based on Phillips curves, are generally augmented with some mechanism to incorporate adaptive expectations. Such models include lagged values of inflation as determinants of current and future inflation. Indeed, lagged inflation typically accounts for the lion's share of their explanatory power.

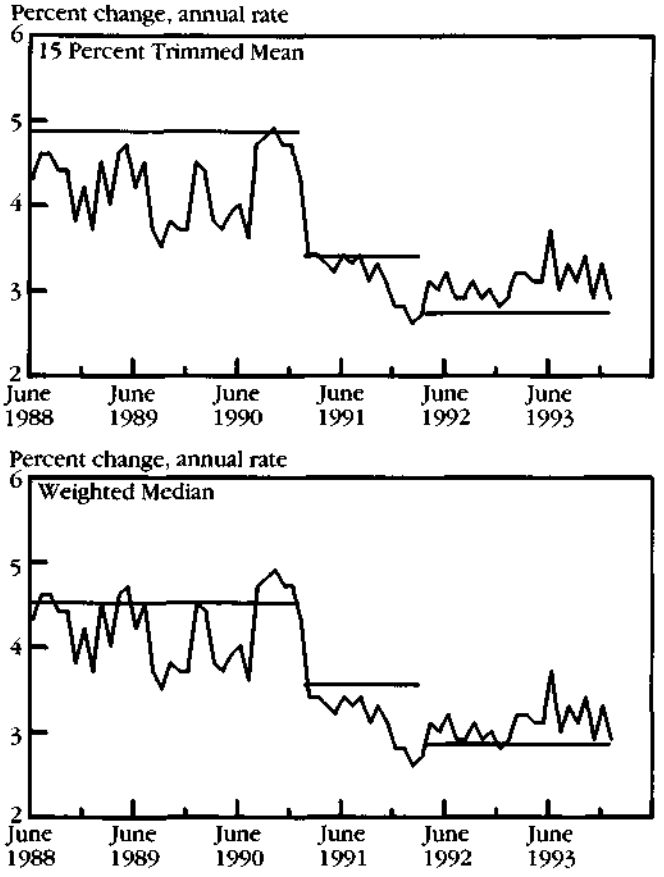
Our analysis of the inflation experience since 1982, however, raises questions about the short-run reliability of models that assume adaptive expectations. The absence of serial correlation since 1982 suggests that lagged inflation may matter only when inflation is high or variable, as in the period from 1966 through 1982. Indeed, the autoregressive nature of inflation seems to be unique to this period. Persistence of CPI inflation was negligible from 1955 to 1965, when the inflation rate (like now) was low and less variable. In fact, first-order autocorrelation of the CPI less food and energy was marginally *negative* from 1959 (when it was first reported) to 1967.

We speculate that the high degree of autocorrelation between 1968 and 1983 may be an

■ 8 The cumulative rank scores provided by the Lombard test suggest a potential change in April 1992.

FIGURE 7

Expected Inflation versus Core Trends, 1988–93



SOURCE: University of Michigan, Survey of Consumers.

artifact of an environment in which inflation policy was perceived as nonstationary or nearly so. In such a world, current inflation is the best predictor of future inflation. However, when a deliberate policy succeeds in maintaining inflation at low levels, expectations naturally tend to stabilize. The clearly articulated disinflation policy adopted in 1979 was to some extent a deliberate attempt to make inflation a stable process again. The univariate results presented above offer some evidence of the success of this policy.

Our speculation that the persistence of inflation shocks in the 1970s is largely an artifact of an unstable policy regime is consistent with the results of Schultze (1986). He finds no significant serial correlation in inflation (based on annual data) in the period 1871 to 1914, when the gold standard was in operation. On the contrary, Schultze finds evidence that inflation during the gold standard era was regressive on the *price level*. That is, whenever the price level rose above its trend path, it tended to have a negative influence on inflation in the next year. Schultze attributes this result to an implicitly accepted reference norm (or, if you will, a prevailing set of expectations) that appeared to emerge naturally under the gold standard regime.

Our hypothesis about the importance of expectations in determining actual inflation may also be supported by the change-point test findings of relatively abrupt changes in core inflation. The most substantial reductions in the trend inflation rates of all core measures occurred in either January or February 1991, coincident with the climax of the Persian Gulf War. We conjecture that events like the Gulf War can lead to watershed changes in expectations when coupled with a deliberate, if not precisely specified, policy.

Figure 7 provides some basis for identifying expectations as a factor accounting for the abruptness in inflation changes. Household expectations of inflation appeared to stabilize around substantially lower levels immediately after the Gulf War was resolved. In contrast, household expectations were quite variable and on average higher in the 30 months or so prior to the climax of the conflict.

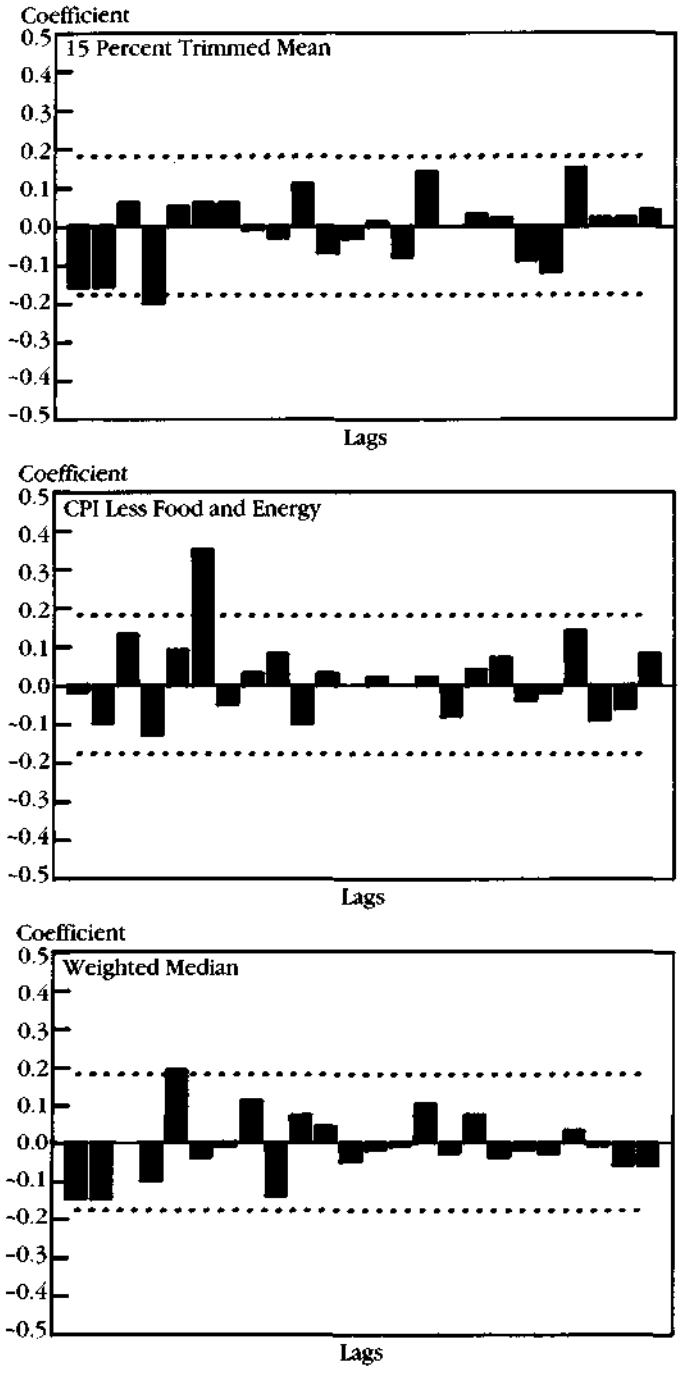
Given the history of oil price shocks (associated with Mideast crises) and subsequent policy responses, it is perhaps surprising that inflation expectations would actually fall. We note, however, that events of the late 1980s and early 1990s occurred in the context of a longer-term policy strategy that sought to achieve further progress toward price stability.

Although the FOMC does not specify a numerical objective for inflation, its monetary policy report to Congress has consistently contained language indicating that the longer-run intent of policy is to reduce inflation further. By the end of the Gulf War, policymakers had taken a series of actions over a number of years that helped to prevent the surge in oil prices from interfering with the longer-term objective of price stability.[9] The inflationary pressures leading up to and during the war in some sense provided a test of this resolve.

■ 9 For an analysis of the events surrounding the most recent oil price shock, see Taylor (1993).

APPENDIX

Autocorrelation Function of Deviations around Trend Means



NOTE: Dotted lines denote 5 percent confidence ranges. When series are serially independent, we might expect one estimate in 20 to be outside the range.
SOURCE: Authors' calculations.

IV. Concluding Remarks

Fourteen years have passed since the Federal Reserve embarked on its long-run policy of disinflation. Despite a slight acceleration in the inflation rate in the late 1980s, the trend appears to be one consistent with continuing, but episodic, declines. Over the last three years, core measures of inflation have averaged around 3 percent, more than a full percentage point less than the average rate over the previous eight years.

Inspection of the time-series properties of core measures suggests that it is not unreasonable to conclude that over substantial periods (say, five to eight years), the inflation rate varied around a fixed mean. To the extent that any significant systematic movements in inflation occurred within such periods, they seem to have been dwarfed by noise at monthly frequencies. This is not to say that core inflation did not change, only that at monthly frequencies, any potential permanent or persistent changes have been relatively small and hard to detect. More substantial changes in inflation since 1982 have been infrequent and rather abrupt.

The relative stability of core inflation measures within extended periods is difficult to reconcile in models commonly used to explain changes in inflation. We conjecture that consistent monetary policy can lead to the development of an inflation norm. The prevailing set of expectations embedded in the norm could play a considerable role in stabilizing the inflation rate.

Although the Federal Reserve has consistently identified continuing progress toward price stability as one of its objectives, an exact numerical path is not specified. Thus, households and financial market participants have no precisely defined benchmark against which to monitor the process of disinflation. Events like the Gulf War appear to be a focal point. To the extent that the inflationary pressures preceding and during the war provided a test of the central bank's resolve to make continuing progress toward price stability, the resolution of the conflict may have triggered a watershed for changing expectations.

References

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