Progress Toward Price Stability: A 1997 Inflation Report

By Todd E. Clark

The primary goal of Federal Reserve monetary policy is to foster maximum long-term growth in the U.S. economy by achieving price stability over time. Price stability will be achieved**,** according to some definitions, when inflation ceases to be a factor in the decision-making processes of businesses and individuals. Although the Federal Reserve has made considerable progress toward price stability since the early 1980s, inflation remains above the level most analysts would associate with price stability. Because stable prices are essential to maximum long-term economic growth and living standards, the Federal Reserve seeks to contain and gradually reduce inflation until price stability is attained.

This article reviews recent inflation developments in the United States in relation to the Federal Reserve's goal of achieving price stability over time. The first section examines the behavior of inflation over the past year and finds that all major measures of inflation declined, to the surprise of most observers. The second section shows that forecasters expect a healthy economy and an unwinding of some of the factors slowing inflation last year to produce slightly higher inflation in 1998. The third section evaluates the behavior of long-term inflation expectations over 1997 and concludes that the public has become more optimistic about long-term inflation prospects. Together, these findings suggest the Federal Reserve made some headway in lowering inflation last year but will need to remain vigilant if it is to achieve price stability over time.

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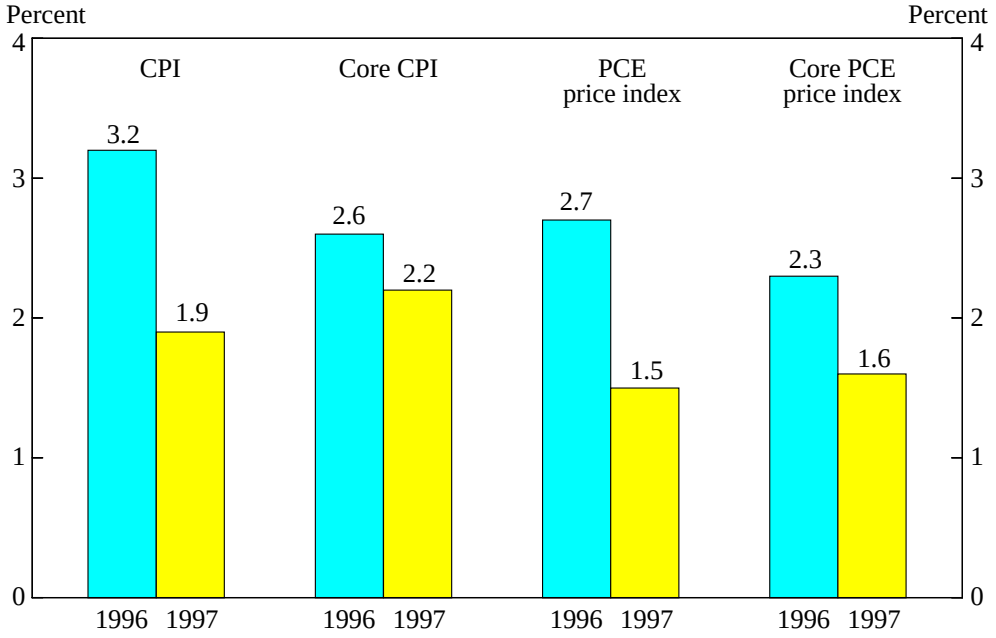
I. INFLATION IN 1997

The surprising decline of inflation during 1997 reflected a variety of factors. Decelerating food and energy prices slowed many measures of inflation. While the high level of resource utilization probably generated some inflationary pressures, other factors such as the strong dollar and slower inflation of medical care prices more than offset the pressures.

Inflation statistics and forecasts

As measured by all of the major price indexes described in the appendix, inflation declined in 1997. Inflation in the all-items consumer price index (CPI) dropped from 3.2 percent in 1996 to 1.9 percent in 1997 (Chart 1).[1] Inflation in the so-called *core* CPI, which excludes food and

Chart 1
CONSUMER PRICE INFLATION



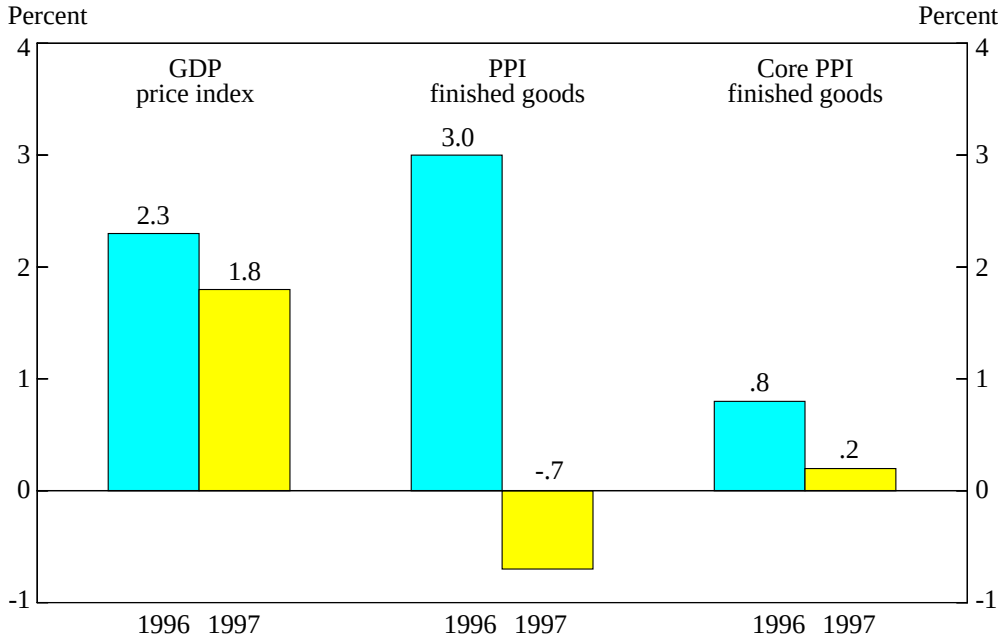
Note: Data are Q4/Q4 percent changes.
Sources: Bureau of Labor Statistics and Bureau of Economic Analysis.

energy prices, declined from 2.6 percent to 2.2 percent. According to an alternative measure of consumer prices, the chain-weighted price index for personal consumption expenditures (PCE price index), inflation was somewhat lower but similarly behaved. Inflation in the overall PCE price index fell from 2.7 percent in 1996 to 1.5 percent in 1997, while inflation in the core PCE price index slowed from 2.3 percent to 1.6 percent.

Other measures of inflation in final goods and services prices also declined in 1997 (Chart 2). Inflation in the chain-weighted price index for gross domestic product (GDP price index) decreased from 2.3 percent in 1996 to 1.8 percent in 1997. Inflation in the producer price index (PPI) for finished goods fell from 3.0 percent in 1996 to -0.7 percent in 1997. Inflation in the core PPI for finished goods, which excludes food and energy prices, slowed from 0.8 percent to 0.2 percent.

The favorable inflation developments of 1997 surprised most policymakers, forecasters, and consumers (Table 1).[2] In late 1996 or early 1997, forecasts by the Federal Open Market Committee (FOMC), the Council of Economic Advisers (CEA), the Congressional Budget Office (CBO), and the average private-sector forecaster in both the Survey of Professional Forecasters and the Blue Chip consensus all suggested the CPI would rise roughly 3 percent and the GDP price

Chart 2
OTHER MEASURES OF INFLATION



Note: Data are Q4/Q4 percent changes.
Sources: Bureau of Labor Statistics and Bureau of Economic Analysis.

index would rise about 2.5 percent. The average respondent to the Livingston Survey's biannual poll of economists from business, government, banking, and academia forecast CPI inflation of 3.0 percent. According to the consumer survey conducted by the University of Michigan, the typical household anticipated CPI inflation of 3.0 percent in 1997. Very few forecasters expected inflation to stay as low as it did in 1997.[3] For example, none of the more than 30 firms included in the Survey of Professional Forecasters predicted CPI inflation of 1.9 percent or less.

The surprise in inflation, however, was not unusually large by historical standards. In past years, the gap between actual inflation and year-ahead forecasts has averaged between 0.5 and 1 percentage point, depending on the particular period and inflation measure (McNees 1992, 1995).[4] For example, from 1987 to 1996, the difference between actual CPI inflation and the Blue Chip consensus forecast averaged 0.7 percentage point.[5] In 1997, actual CPI inflation was about 1 percentage point below the typical forecast, and actual GDP price index inflation was roughly 0.5 percentage point below the typical forecast. These gaps between actual and projected inflation highlight the uncertainty of forecasts. Some of the factors that may affect inflation, such as weather-related disruptions of food production, are difficult to predict.

Table 1

YEAR-AHEAD INFLATION FORECASTS FOR 1997

(Percent)

Forecast	Date published	CPI	GDP price index
FOMC	February 1997	2.75-3.0	NA
CEA	February 1997	2.6	2.5
CBO	January 1997	2.9	2.4
Survey of Professional Forecasters	4th Quarter 1996	3.0	2.5
Blue Chip consensus	December 1996	3.0	2.5
Livingston Survey	December 1996	3.0	NA
University of Michigan Consumer Survey	December 1996	3.0	NA
Addenda:			
Actual inflation in 1997		1.9	1.8

Notes: Data are Q4/Q4 percent changes, except for the Livingston Survey and Michigan survey figures, which are December/December percent changes. The FOMC forecast is the range of central tendencies. Figures from the Survey of Professional Forecasters and from the University of Michigan Consumer Survey are the medians of individual forecasts and expectations, respectively. Data from the Blue Chip consensus and Livingston Survey are the averages of individual forecasts. GDP price index forecasts are not available for the FOMC, Livingston Survey, and Michigan survey. The Survey of Professional Forecasters and the Livingston Survey are compiled by the Federal Reserve Bank of Philadelphia.

The effects of food and energy prices on inflation

The behavior of inflation in 1997 was importantly affected by decelerating food and energy prices. After rising 4.2 percent in 1996, consumer food prices increased only 1.7 percent in 1997. Consumer energy prices reversed some of 1996's rapid rise, declining 1.0 percent. Producer food and energy prices posted broadly comparable decelerations. The sharp deceleration of food and energy prices accounted for much of the slowdown in overall CPI, PCE, and PPI inflation. For example, more than three-quarters of the reduction in overall CPI inflation was attributable to the food and energy components of the index. While most forecasters had generally expected these developments, the deceleration in food and energy prices and, in turn, overall prices was greater than anticipated.

The more favorable behavior of food and energy prices reflected an easing of the conditions that pushed prices up in 1996. As grain stocks recovered from historically low levels, grain prices declined, holding down prices for products such as beef, poultry, milk, cheese, and eggs. An end to some temporary supply disruptions and a softening in demand due to more moderate weather slowed energy prices.

Despite their large impact on overall inflation last year, food and energy prices probably had little effect on core inflation. By definition, the core CPI, PCE, and PPI exclude food and energy prices. Therefore, big changes in food or energy prices affect core price indexes only if the changes pass through to other prices, and then only with a lag. Typically, large movements in food or energy prices do not pass through to core price indexes because the movements are soon reversed. The large energy price increases of 1996, for example, were followed by price decreases in 1997. Last year's changes in food and energy prices likely did not pass through to core inflation.[6]

Factors affecting overall and core inflation

One factor affecting both overall and core inflation in the past year was the level of resource utilization, which many economists feel generated modest inflationary pressures even though such pressures were difficult to discern in the major price indexes. Already high in 1996, the level of resource utilization increased further last year. The rate of capacity utilization edged up from an average of 82.4 percent in 1996 to 82.7 percent in 1997. In the past, such levels have been associated with increases in inflation (Corrado and Mattey). The unemployment rate declined from an average of 5.4 percent in 1996 to 5.0 percent, a rate somewhat below most estimates of the *natural rate*—the lowest rate associated with stable inflation (Weiner).[7] The labor market tightness evident in the low unemployment rate appeared to put some upward pressure on compensation costs. Average hourly earnings and the employment cost index grew somewhat more rapidly in 1997 than in 1996 (Chart 3).[8]

Although accelerating compensation costs are usually expected to generate more rapid inflation, such was not the case in 1997. Any inflationary pressures generated by tight labor markets were mitigated by strong gains in productivity. After rising 1.7 percent in 1996, nonfarm business productivity advanced 2.2 percent in 1997. With worker productivity accelerating more than compensation costs, the per-unit cost of producing a typical good slowed. Therefore, despite tight labor conditions, firms were able to restrain price increases.

Several other factors worked to significantly offset inflationary pressures, including technical adjustments to the CPI and the strong dollar. As detailed in the box, changes in the procedures used to construct the CPI slowed inflation in the overall and core indexes by nearly 0.1 percentage point. The increase in the value of the dollar in 1996 and 1997 led to decelerating prices for many imported goods, reducing inflation both directly and indirectly. After falling 1.7 percent in 1996, nonoil import prices fell 2.5 percent in 1997.[9] Declining import prices directly slowed inflation measures that include imports, such as the CPI and PCE price index. Lower import prices may have also indirectly curbed inflation by forcing domestic producers to restrain prices in order to compete with foreign goods. Some observers cite the deceleration of vehicle prices last year as evidence of the competitive pressures created by the strong dollar. According to the PPI, prices received by domestic auto producers fell 1.1 percent in 1997 after declining 0.4 percent in 1996.

In addition, many analysts have argued that any inflationary pressures in 1997 were offset by slower medical price inflation and more rapid declines in personal computer prices. Inflation in prices of medical services was checked by a variety of forces, such as a continued shift from fee-for-service health care to managed care plans. Computer prices fell more rapidly in 1997

Chart 3
GROWTH IN COMPENSATION

Note: Data are Q4/Q4 percent changes.
Sources: Bureau of Labor Statistics.

than in previous years, helped by sharp reductions in prices of central processing units. In an accounting sense, the deceleration of medical and computer prices modestly slowed inflation last year. For example, roughly one-eighth of the reduction in core CPI inflation may be attributed to slower medical price inflation.[10] Some economists would argue, however, that medical and computer prices should not be highlighted as factors affecting inflation. In any given year, the prices of some goods rise more rapidly than the prices of other goods, without any bearing on inflation trends, as relative prices move in response to changing supply and demand conditions for individual goods.[11]

Many of these developments were unanticipated in the typical forecast, which called for a stable or weaker dollar and less favorable trends in medical and computer prices. With a strong dollar pushing down import prices in 1996, most observers expected a steady or weaker dollar in 1997 to produce some acceleration in import prices and, in turn, overall prices. In reality, the dollar advanced further and import prices decelerated, reducing inflation. Anecdotal reports of pressures on health care costs led many forecasters to anticipate a modest increase in medical price inflation and some resulting pressure on overall inflation. In fact, medical price inflation slowed and helped curb consumer price inflation. Viewing the steep

THE EFFECTS OF CHANGES IN CPI METHODOLOGY

A series of technical adjustments to the CPI slowed inflation last year and will further slow inflation in coming years. Inflation in 1997 was reduced by a mid-1996 improvement in the way newly priced items enter the CPI (Clark; U.S. Department of Labor 1996c).[12] New items enter the CPI because the Bureau of Labor Statistics (BLS) rotates the sample of specific items included in the index in an effort to keep up with shifts in consumer spending habits. For example, the BLS may rotate from measuring the price of bananas at one supermarket to measuring the price at another supermarket. New items also enter the CPI because the BLS replaces specific items that become unavailable with substitutes. The improved treatment of new items was expected to lower overall CPI inflation by 0.1 percentage point per year. Given the midyear implementation of the change, inflation in 1996 should have been affected by only about half that amount, or 0.05 percentage point. The full effect of 0.1 percentage point should have been felt in 1997. Accordingly, from 1996 to 1997 the technical improvement probably slowed both overall and core CPI inflation by about 0.05 percentage point.[13] The adjustment also affected, although to an even lesser degree, the PCE and GDP price indexes, which are constructed using detailed price information from the CPI.

In 1998, CPI inflation will be reduced by an updating of the basket of goods and services for which the index tracks prices. Effective in January, the basket is based on the expenditures of the typical consumer over 1993-95 instead of 1982-84. In the near term, the updating of the market basket will help mitigate the so-called *substitution bias* in the CPI. The CPI tracks the cost of a fixed set of goods, when in fact consumers substitute among goods as individual prices change by different amounts. By pricing a fixed set of goods and services, the index modestly overstates increases in the cost of living. The market basket update should slow measured inflation in the CPI and core CPI by 0.1 to 0.2 percentage point per year beginning in 1998 (U.S. Department of Labor 1996a).

The CPI inflation rate this year will also be checked by the BLS's adoption of a more accurate approach to adjusting personal computer prices for quality improvements. Computer prices are adjusted for quality because the CPI is designed to measure the average change in prices of constant-quality goods and services. While the old *matched-model* method involved using only the prices of computers with unchanged features, the new *hedonic* procedure uses a statistical model to value each important feature of computers, including both new and unchanged models (U.S. Department of Labor 1997a). In recent years, new models offering major improvements in features such as processing speed have appeared at a rapid rate. The old quality-adjustment procedure significantly understated quality improvements and, accordingly, the rate of decline in computer prices.

Continued . . .

The new, more accurate method will show computer prices declining more rapidly and thereby will modestly reduce CPI inflation.

In 1999, inflation will be slowed by a shift in the method for aggregating the prices of specific goods included in the CPI (U.S. Department of Labor 1997b). Currently, the BLS uses a so-called *arithmetic means* approach to entering specific item prices into the CPI. Next year, the BLS will use a so-called *geometric means* method to enter some specific prices into the index. The change in method should further reduce the substitution bias in CPI inflation.[14] While the arithmetic means approach assumes no substitution across goods, the geometric means method allows some substitution. The BLS plans to use geometric means to aggregate specific item prices within only those components of the CPI for which substitution appears important. Depending on how many components the geometric means approach is applied to, the change in aggregation method will lower CPI inflation by up to 0.25 percentage point per year. The PCE and GDP price indexes will also be affected, because the indexes include some detailed CPI information.

decline of computer prices in 1996 as a temporary result of plummeting memory prices, analysts believed computer prices would fall less rapidly in 1997 than in 1996 and thereby reduce some of the drag on overall inflation. Yet computer prices fell even more rapidly in 1997, further slowing inflation. Thus, a variety of factors contributed to the largely unexpected slowing of inflation last year.

II. THE OUTLOOK FOR INFLATION IN 1998

Most observers expect inflation to rise modestly in 1998 from 1997 levels (Table 2). Recent forecasts for CPI and GDP price index inflation in 1998 exceed last year's actual rates of 1.9 and 1.8 percent, respectively. For example, in January the CBO forecast CPI inflation of 2.4 percent and GDP price index inflation of 2.1 percent. The average forecaster included in January's Blue Chip consensus projected CPI inflation of 2.3 percent and GDP price index inflation of 2.1 percent. The forecasts of the Survey of Professional Forecasters and the Livingston Survey are slightly higher than the CBO and Blue Chip projections and than consumer expectations. The less favorable outlooks of the Survey of Professional Forecasters and Livingston Survey at least in part reflect the fact that their forecasts were made earlier. Most forecasters lowered their projections in late 1997 and early 1998 in response to favorable inflation news.

As always, however, the outlook for inflation is uncertain. One indicator of uncertainty is the degree of disagreement among forecasters. Some evidence suggests sharp differences in individual forecasts signal a highly unsure outlook, while small differences signal relatively modest uncertainty (Zarnowitz and Lambros).[15] The available surveys of private-sector forecasters suggest a wide range of possible inflation outcomes and, therefore, considerable risks to

Table 2

INFLATION FORECASTS FOR 1998

(Percent)

Forecast source	Date published	CPI	GDP price index
CBO	January 1998	2.4	2.1
Survey of Professional Forecasters	4th Quarter 1997	2.6	2.3
Blue Chip consensus	January 1998	2.3	2.1
Livingston Survey	December 1997	2.5	NA
University of Michigan Consumer Survey	January 1998	2.3	NA

Notes: Data from the CBO are Q4/Q4 percent changes. Data from the Survey of Professional forecasters and Blue Chip consensus are the medians and averages, respectively, of individual forecasts of Q4/Q4 percent changes. The Livingston Survey figure is the average of individual forecasts of December/December percent changes. The figure for the University of Michigan Consumer Survey is the median of individual expectations for inflation in the next 12 months. GDP price index forecasts are not available from the Livingston Survey or the Michigan survey. The Survey of Professional Forecasters and the Livingston Survey are compiled by the Federal Reserve Bank of Philadelphia.

the outlook. For example, a few of the firms included in the Survey of Professional Forecasters project CPI inflation of about 2 percent, while some others forecast inflation of nearly 3.3 percent. A second, statistical indicator of uncertainty is available from the Survey of Professional Forecasters. The Survey asks participants to estimate the chances that inflation in the GDP price index will fall within different ranges—for instance, the probability that inflation will be between 2.0 and 2.9 percent. According to these estimates, there is a good chance inflation will differ substantially from the typical forecast. In 1997:Q4, the average forecaster put the probability of 2-2.9 percent inflation at only about 50 percent and the probability of 1-2.9 percent at roughly 80 percent. While these indicators highlight the considerable uncertainty in forecasts for 1998, the outlook for this year is no more uncertain than usual.[16]

Factors expected to push up inflation

The typical forecast for 1998 reflects a number of factors. Many analysts expect overall inflation measures such as the CPI to be boosted modestly by food prices. According to the U.S. Department of Agriculture, for example, food price inflation is projected to change very little in 1998 after slowing in 1997. Overall inflation should rise in part because food prices will no longer slow inflation. Food prices will likely affect the GDP price index less than the CPI and have essentially no effect on core inflation.

Another important element in the inflation outlook is the level of resource utilization, which most expect to generate modest inflationary pressures. Forecasters generally believe the economy will continue to operate at a high level of resource utilization in 1998. For example, the average participant in the 1997:Q4 Survey of

Professional Forecasters projects unemployment of 4.9 percent. Historical relationships suggest such conditions will put some upward pressure on inflation, although the subdued behavior of inflation in recent years in the face of similar conditions has raised questions about the reliability of historical associations (Congressional Budget Office; Lown and Rich; Mandel).

Most forecasters believe medical care prices will be one other factor tending to push up inflation in 1998, reversing the trend of recent years. Reports that some large health care providers will increase rates in response to recent financial losses and a view that the benefits of shifts to managed care have been largely realized lead many observers to project higher inflation in medical care prices. An acceleration of medical prices would modestly boost inflation. Some analysts, however, argue that excess capacity in the health care industry will restrain medical prices (PaineWebber Economics Group).

Factors expected to restrain inflation

The forces pushing inflation upward in 1998 will likely be mitigated by two of the factors that slowed inflation in 1997. First, additional technical adjustments to the CPI will slow measured inflation this year. These adjustments, reviewed in the box, appear to mask some deterioration in the inflation outlook. In the absence of the technical changes, many forecasts of CPI inflation would be higher.[17] Second, many forecasters anticipate a further strengthening of the dollar against the currencies of the Asian nations experiencing financial problems. The strong dollar will cause the prices of imports from those nations to continue to decline, probably even more rapidly than in 1997. Falling import prices would directly slow inflation measures that include imports and indirectly curb inflation by forcing domestic producers to restrain prices in order to remain competitive. These effects will be compounded if financial problems lead Asian producers to dump goods on U.S. markets.

On balance, most forecasters expect those factors pushing inflation up to dominate the factors restraining price increases. Therefore, inflation is projected to rise slightly, reversing some of last year's unexpected decline in inflation. The next section evaluates whether future years are expected to bring progress toward price stability.

III. THE LONG-TERM OUTLOOK FOR INFLATION

Examining long-term expectations of inflation is another useful means of gauging progress toward price stability. Long-term expectations provide a signal of how the public perceives a central bank's commitment to price stability. If, for example, the public believes a central bank will act to gradually lower inflation, long-term inflation expectations will fall over time. In 1997, inflation expectations declined, indicating the public has become more optimistic about the long-term outlook for inflation.

Behavior of expectations in 1997

During 1997, most measures of long-term inflation expectations declined modestly (Table 3). Projections by the CEA provide two indicators of long-term expectations. Last year, the CEA reported forecasts of annual inflation in the CPI and GDP price index through the early years of the next decade. The five-year average of the CPI inflation forecasts fell from 2.7 percent in February to 2.5 percent in August. The five-year average forecast of inflation in the GDP price index declined from 2.6 percent to 2.4 percent. Two other indicators of expectations are provided by the CBO, which presented annual CPI and GDP price index forecasts through the middle of the next decade. The ten-year average of the CPI inflation forecasts decreased from 3.0

Table 3

LONG-TERM INFLATION EXPECTATIONS

(Percent per year)

CPI inflation

Expectation source	Date published	Expectation horizon	Expectation
CEA	February 1997	1997-2001	2.7
	August 1997	1998-2002	2.5
CBO	January 1997	1997-2006	3.0
	January 1998	1998-2007	2.7
Survey of Professional	4th Quarter 1996	10 years	3.0
Forecasters	4th Quarter 1997	10 years	2.7
Livingston Survey	December 1996	10 years	3.0
	December 1997	10 years	2.8
University of Michigan	December 1996	5-10 years	3.0
Consumer Survey	December 1997	5-10 years	3.1

GDP price index inflation

Expectation source	Date published	Expectation horizon	Expectation
CEA	February 1997	1997-2001	2.6
	August 1997	1998-2002	2.4
CBO	January 1997	1997-2006	2.6
	January 1998	1998-2007	2.4

Notes: CEA and CBO figures are formed as the averages of reported yearly figures. Data from the Survey of Professional Forecasters and the University of Michigan Consumer Survey are the medians of individual forecasts and expectations, respectively. Figures from the Livingston Survey are the averages of individual forecasts. The Survey of Professional Forecasters and the Livingston Survey are compiled by the Federal Reserve Bank of Philadelphia.

percent in January 1997 to 2.7 percent in January 1998. The ten-year average forecast for the GDP price index fell from 2.6 percent to 2.4 percent.

Surveys of professional forecasters, economists, and consumers provide additional evidence of declining long-term inflation expectations. The Survey of Professional Forecasters tracks expectations of CPI inflation over the next ten years. The ten-year forecast of the average survey participant fell from 3.0 percent in 1996:Q4 to 2.7 percent in 1997:Q4. The Livingston Survey measures the ten-year CPI inflation expectations of economists. The expectations of the average Livingston Survey respondent decreased from 3.0 percent in December 1996 to 2.8 percent in December 1997. The University of Michigan tracks consumers' expectations of CPI inflation

over the next five to ten years. The typical consumer's five-year to ten-year expectations edged up from 3.0 percent in December 1996 to 3.1 percent in December 1997.

Other indicators derived from yields on 5-year and 10-year Treasury notes also suggest long-term inflation expectations fell last year. In general, the nominal yield on a government security reflects the real rate of return required by investors, expected inflation over the life of the security, and other factors such as the return premium investors require for uncertainty about inflation. In 1997, the U.S. Treasury Department began issuing *inflation-protected* 5-year and 10-year notes—securities indexed to the CPI such that returns are not affected by inflation. The difference between yields on nominal and inflation-protected notes of the same maturity reflects expected inflation and the "other factors" affecting returns. To the extent the "other factors" are roughly constant, changes in the yield difference between nominal and inflation-protected securities correspond to changes in expected inflation.[18] Over the course of last year, yield differences declined, suggesting reduced inflation expectations. The spread between nominal and inflation-protected returns on 10-year notes fell almost one percentage point from January to December. The spread on 5-year notes declined 0.3 percentage point from July, when the Treasury Department began issuing inflation-protected 5-year securities, to December.

Implications for monetary policy

Overall, the decline of long-term inflation expectations last year suggests that, in some sense, the public became more convinced of the Federal Reserve's commitment to price stability. Over the course of the year, the public came to believe monetary policy would produce lower inflation in the long term. Some of the decline in inflation expectations, however, probably reflected technical adjustments to the CPI rather than perceptions of the Federal Reserve's commitment to reducing inflation. As described in the box, the government agency responsible for the CPI implemented changes to the index in January and plans another important change in 1999. The PCE and GDP price indexes will also be affected, because the indexes include some detailed CPI information. The adjustment planned for next year, which was announced in early 1997, wholly accounts for the reduction in CEA inflation expectations. The drop in expectations from the Survey of Professional Forecasters also may have been partly attributable to technical adjustments. A special question in the 1997:Q2 survey revealed that only one-quarter of the participants were taking into account future changes in CPI methodology. Although there is no definitive evidence, some of the reduction in expectations in the 1997:Q4 survey may have been due to more forecasters allowing for the imminent technical changes.

While long-term inflation expectations have declined, they exceed recent inflation rates. For example, as of July, the CEA expected a five-year average CPI inflation rate of 2.5 percent. In the absence of the technical adjustments of 1998 and 1999, the CEA would have projected inflation of roughly 2.9 percent. As another example, the average respondent in the 1997:Q4 Survey of Professional Forecasters expected a ten-year average inflation rate of 2.7 percent. In the absence of technical changes to the CPI, the average inflation projection from the survey may have been close to 3 percent. By comparison, one indicator of recent inflation trends is provided by the core CPI, which rose 2.6 percent in 1996 and 2.2 percent in 1997. The gap between long-term inflation expectations and recent inflation rates suggests forecasters expect some of the most recent decline in inflation to be reversed. Of course, if actual inflation continues to come in lower than anticipated, as it did in 1997,

forecasters may further reduce their long-term inflation projections.

IV. CONCLUSIONS

Given the goal of containing and ultimately reducing inflation, recent developments have been largely favorable. All major measures of inflation slowed last year, surprising most observers. Weighing the factors likely to affect prices in 1998, forecasters generally expect inflation to rise slightly. Declining long-term inflation expectations indicate the public has become more optimistic about long-term inflation prospects.

APPENDIX

ALTERNATIVE INFLATION MEASURES

Several measures of inflation in final goods and services prices are available. These include the consumer price index (CPI), the chain-weighted price index for personal consumption expenditures (PCE price index), the chain-weighted price index for GDP (GDP price index), and the producer price index for finished goods (PPI). The CPI and the PCE price index measure the prices of consumer goods and services. The GDP price index tracks the prices of all final goods and services, including goods and services purchased by consumers, businesses, and government. The PPI tracks prices received by producers of finished goods.

More specifically, the CPI tracks the average change in the prices of a fixed set of goods and services purchased by the typical consumer. The CPI is known as a *fixed-weight* index because the basket of goods and services is fixed from year to year. The all-items CPI, known simply as *the CPI*, measures the average price change of all goods and services purchased by consumers. The more specialized *core* CPI measures the prices of nonfood and nonenergy goods and services. The exclusion of food and energy prices, which tend to be highly volatile, can help make underlying inflation trends more apparent.

The PCE price index provides an alternative measure of consumer prices. Like the CPI, the PCE price index measures the average change in the prices of goods and services purchased by consumers. Moreover, most of the prices for specific goods and services included in the PCE price index come from the CPI. However, the PCE price index differs from the CPI in some important ways. First, the PCE price index allows for broad year-to-year changes in the basket of goods and services purchased by consumers. Particularly, the index allows for shifts across general categories of goods, such as from ground beef to frozen food. Inflation in the PCE price index is the average of two fixed-weighted measures of overall price change. In measuring inflation from the past year to the current year, one fixed-weighted index uses the past year's composition of consumption purchases to weight individual price changes, while the other index uses the current year's composition of purchases to weight individual price changes. Second, for some items, the PCE price index and the CPI use different price information. For example, the PCE price index is constructed using producer, rather than consumer, price indexes for computers. Third, the weights assigned to specific items differ between the PCE price index and the CPI. Medical care, for instance, receives a larger weight in the PCE price index than in the CPI.[19]

APPENDIX - continued

The GDP price index measures the average price change for all final goods and services produced in the United States. Unlike the CPI and the PCE price index, the GDP price index excludes the prices of imports. Like inflation in the PCE price index, inflation in the GDP price index is the average of two different fixed-weighted measures of overall price change. One of the fixed-weighted indexes uses the past year's composition of purchases to weight individual price changes, while the other index uses the current year's composition of purchases to weight individual price changes. Roughly three-fourths of the specific item prices used to construct the GDP price index come from the CPI and PPI.

Finally, the PPI tracks the average change in prices received by domestic producers of a fixed set of goods. While the PPI includes some services, the index largely reflects just goods prices. A core PPI for finished goods—which excludes food and energy prices—is also available.

ENDNOTES

1 Unless otherwise noted, all inflation rates in the article are calculated on a Q4-to-Q4 basis. On a December-to-December basis, CPI inflation fell from 3.3 percent in 1996 to 1.7 percent in 1997. Core CPI inflation declined from 2.6 percent to 2.2 percent over the same period.

2 Forecasters generally failed to accurately predict not only the level of inflation but also the direction of change. Most expected core inflation to rise in 1997.

3 The actual CPI rose 2.3 percent and 1.9 percent on an annual average and Q4/Q4 basis, respectively. The actual GDP price index rose 2.0 percent and 1.8 percent on an annual average and Q4/Q4 basis. Of the 52 firms surveyed for the December 1996 Blue Chip consensus, four projected annual CPI inflation of 2.3 percent or less, and nine projected annual GDP price index inflation of 2.0 percent or less. Of the more than 30 forecasters included in the 1996:Q4 Survey of Professional Forecasters, one predicted annual CPI inflation of 2.3 percent or less. Four firms projected annual inflation in the GDP price index of 2.0 percent or less, and two forecast Q4/Q4 inflation of 1.8 percent or less.

4 The gap between actual inflation and year-ahead forecasts corresponds to the mean absolute error.

5 The Blue Chip forecasts for each year were published in December of the previous year. The root mean squared error of Blue Chip forecasts from 1987 to 1996 is 0.9 percent. The accuracy of forecasts from fourth quarter issues of the Survey of Professional Forecasters is essentially the same as the accuracy of the Blue Chip consensus.

6 In the unusual event that changes in food or energy prices persist for some time, the changes can temporarily affect core inflation. If energy prices double and remain fixed at the higher level, core inflation may be elevated for several years as firms producing nonenergy goods gradually pass through the energy cost increase. The increase in core inflation will be temporary because a permanent increase in the *level* of energy prices can have a permanent effect on only the *level* of core prices.

7 According to a special question posed in the 1996:Q3 Survey of Professional Forecasters, the average forecaster who used the natural rate concept estimated the rate at 5.5 percent, and three-quarters of the forecasters put the rate at 5.25 percent or greater. Many forecasters lowered their estimates in 1997 as inflation remained subdued despite the strong economy. According to the 1997:Q3 Survey of Professional Forecasters, the average forecaster put the natural rate at 5.25 percent, and three-quarters estimated the rate at 5.0 percent or greater.

8 Although part of the acceleration in compensation reflected an increase in the minimum wage, analysis of compensation in occupations not likely affected by the minimum wage suggests some of the acceleration was due to labor market tightness.

9 The reported numbers are December/December percent changes in data from the Bureau of Labor Statistics. Other data display a similar pattern. Figures from the Bureau of Labor Statistics show that prices for imported consumer goods excluding automobiles declined 0.6 percent in 1996 and 0.9 percent in 1997 (December/ December). Figures from the Bureau of Economic Analysis, however, show that prices for imported goods excluding oil, computers, and semiconductors fell 0.8 percent in 1996 and 0.7 percent in 1997 (Q4/Q4).

10 As measured in the CPI, the rate of change in medical prices declined by 0.6 percentage point in 1997. With medical care receiving a weight of almost 10 percent in the core CPI, the deceleration of medical prices slowed core CPI inflation by a total of about 0.04 percentage point.

11 In 1997, for example, consumer tobacco prices rose 7.0 percent, while airfares fell 3.8 percent. In 1996, tobacco prices and airfares advanced 3.0 percent and 7.3 percent, respectively.

12 The BLS implemented one change to the CPI in 1997, reclassifying and redefining items in the hospital and related services component of the index (Clark; U.S. Department of Labor 1996b). The effect of the change was expected to be small.

13 The mid-1996 adjustment had a slightly larger impact on core inflation than on overall inflation because the adjustment had already been applied to food prices in 1995.

14 Particularly, the use of geometric rather than arithmetic means will reduce the *low-level* substitution bias in CPI inflation.

15 However, forecasts may differ for any number of reasons unrelated to uncertainty (Lamont; McNees 1994).

16 Using individual projections from the Blue Chip consensus, the standard deviation across annual average

CPI inflation forecasts declined slightly in 1998, while the standard deviation across GDP price index forecasts was essentially unchanged. The reverse occurred in projections from the Survey of Professional Forecasters. Using probabilities reported in the Survey of Professional Forecasters and the method of Zarnowitz and Lambros, the average firm's forecast error variance was unchanged in 1998. The error variance implied by the average probability distribution edged up in 1998.

[17] The CEA and CBO explicitly note that their forecasts incorporate technical adjustments. Because the Federal Reserve has paid close attention to changes in CPI procedures, the projections of most FOMC members also probably reflect the procedural adjustments. There is no definitive evidence that projections from the Survey of Professional Forecasters, Blue Chip consensus, and University of Michigan Consumer Survey incorporate any adjustments. However, the procedural changes have beenwell-publicized and were near-at-hand as of late 1997, so many professional forecasters probably made adjustments.

[18] Several problems make changes in the spread between nominal and inflation-protected securities an imperfect indicator of changes in inflation expectations. Essentially, the "other factors" affecting nominal yields are only roughly constant and therefore subject to some variation.

[19] In general, the CPI uses weights based on the Consumer Expenditure Survey, while the PCE price index uses weights based on spending by households as measured in the national income and product accounts. In the case of medical care, the CPI and PCE weights differ because the PCE index reflects both employer and employee expenditures while the CPI reflects only employee expenditures.

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