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# How Useful Are Leading Indicators of Inflation?

*By C. Alan Garner*

Many economists expect inflation to rise in 1995. These expectations are based on various approaches to forecasting inflation. One approach is based on the standard economic theory that inflation rises when slack is eliminated from the economy and production exceeds capacity constraints. According to this view, measures of economic slack such as unemployment and capacity utilization provide useful information about the inflation outlook. But the relationship between slack and inflation is complicated and subject to variable lags.

Uncomfortable with this complex relationship, some analysts rely on alternative approaches to forecasting inflation. One approach is based on “leading indicators” of inflation. The leading indicators typically incorporate information on selected prices to augment or replace information on economic slack. The prices selected are usually key commodity prices that fluctuate more or less continuously in response to changing economic conditions. Prominent leading indicators of inflation include the price of gold, broader indexes of commodity prices, and composite indicators that combine several economic series believed to predict the inflation rate.

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How useful are these leading indicators for forecasting inflation? This article examines five widely watched leading indicators. The first section evaluates the strengths and weaknesses of these indicators based on economic theory. The second section evaluates the leading indicators empirically, looking at how the indicators have performed by themselves and whether the indicators add useful information to a standard model relating inflation to economic slack. It is concluded that, of the five leading indicators, the composite indicators have given the most useful early warning signals of inflation turning points, but none of the indicators has recently been successful in predicting inflation magnitudes.

## *FIVE LEADING INDICATORS OF INFLATION*

Five leading indicators of inflation are described in this section. The first is the price of gold, a commodity that once played an important role in the world monetary system and is still held as a store of value by investors in many countries. The next two indicators are the Commodity Research Bureau (CRB) index of commodity futures prices and the *Journal of Commerce* (JOC) index of industrial materials prices. These leading indicators are differing broad-based baskets of commodities that

play a more important role than gold in current economic activity. The last two indicators are the Center for International Business Cycle Research (CIBCR) leading inflation index and the PaineWebber (PW) leading index. These indexes are composite leading indicators of inflation that combine broad-based commodity indexes with other economic variables believed to be useful in inflation forecasting.

### *The price of gold*

The price of gold is viewed by some analysts as a leading indicator of inflation because gold is widely held as a store of value. Gold is a store of value partly because of its physical characteristics, such as durability and attractiveness, and partly because of its historical role as the centerpiece of the world monetary system (Laurent). Many countries issued gold coins and held stocks of gold bullion to fully or partially back their paper currencies. Thus, although gold has industrial uses, much of the demand for gold has always been as a store of value. Moreover, the supply of gold is relatively fixed because new gold production is small compared with the existing stock of the metal.

Even though gold no longer plays a key role in the world monetary system, the price of gold might be a good leading indicator of inflation. The rationale is that if enough people regard gold as a good store of value, the expectation of rising inflation could cause some investors to shift their funds out of financial assets with fixed nominal interest rates into gold coins or jewelry. Because the gold supply is relatively fixed, the price of gold might rise sharply with even a small increase in demand. The general inflation rate, in contrast, tends to rise more slowly because the prices of many goods and services adjust sluggishly. As a result, an increase in the price of gold might precede an increase in the general inflation rate—provided the expectation of rising inflation was correct in the first place.

The price of gold is unlikely to be a highly reliable leading indicator of inflation for several

reasons. The price of gold might give a false signal of inflation by increasing in response to expectations of higher inflation based on erroneous information, such as an inaccurate preliminary estimate of the economic growth rate. When investors eventually discover the error, inflation expectations and the price of gold would adjust down to their correct levels.<sup>1</sup> Moreover, the price of gold might rise relative to the general price level for reasons that are specific only to the gold market, such as an increase in the industrial demand for gold.

The price of gold could also be a misleading indicator because its price fluctuates in response to foreign economic and political factors. Gold essentially trades in a world market. As a result, an increase in the demand for gold might be due to rising inflation expectations abroad rather than in the United States. Foreign political uncertainties also might increase the demand for gold as a store of value, causing its market price to rise. For example, some analysts attributed the higher price of gold in 1993 and 1994 to rising inflation expectations in Southeast Asia and political uncertainties in Russia rather than to increasing U.S. inflation expectations.

### *CRB commodity futures index*

A diversified commodity index, like the futures price index prepared by the Commodity Research Bureau, may be a better leading inflation indicator than the price of gold. The CRB index reflects the prices of futures contracts for 21 commodities (Table 1). The CRB index is monitored widely by financial market participants in part because the index is updated continuously throughout the business day as commodity futures prices fluctuate. A broad index of commodity prices might act as a leading indicator of inflation because, like gold, these commodities can be held as stores of value when the general inflation rate is expected to rise. The prices of these commodities can also adjust quickly to a change in general inflation expectations because commodity futures contracts trade in highly

Table 1

**Components of the Leading Inflation Indexes**Commodity Research Bureau index

corn, oats, soybeans, soybean meal, wheat, soybean oil, cocoa, coffee, sugar, cotton, orange juice, lumber, pork bellies, hogs, live cattle, copper, gold, silver, platinum, crude oil, heating oil

Center for International Business Cycle Research index

employment-population ratio  
JOC index  
growth of domestic nonfinancial debt  
import prices  
percent of businesses expecting higher selling prices  
NAPM price diffusion  
NAPM vendor performance

Journal of Commerce index

cotton, polyester, burlap, print cloth, steel scrap, zinc, copper scrap, aluminum, tin, hides, rubber, tallow, plywood, red oak, benzene, crude petroleum

PaineWebber index

NAPM price diffusion  
NAPM vendor performance  
CRB spot index of industrial prices  
unemployment rate  
trade-weighted dollar  
domestic oil prices  
agricultural prices

efficient auction markets. In contrast, measures of consumer price inflation adjust more sluggishly.

The diversified CRB index may be a better leading indicator than the price of gold for two reasons. First, the commodities in the CRB index play a more important role than gold in current productive activity, meaning a rise in the CRB index is more likely to represent an increase in production costs that must ultimately be passed on to consumers. Second, a diversified commodity price index may be less likely to give false signals of general inflationary pressures because of factors affecting a particular commodity market. Like the price of gold, other commodity prices also fluctuate because of market-specific disturbances to supply or demand having nothing to do with the overall inflation rate. Such market-specific disturbances may average out across a broad basket of commodities,

however, leaving movements in the commodity index that more closely reflect changes in general inflation expectations.

Although the CRB futures price index may be a better leading indicator of inflation than the price of gold, many analysts believe the components of the index are not diversified enough to be a highly reliable leading indicator (Feder). While the index is diversified across several commodity groups, 62 percent of the index represents agricultural commodities and livestock. The CRB index, therefore, is not representative of the broad mix of goods and services purchased by U.S. consumers because the index gives too much weight to agricultural products. Moreover, agricultural products sometimes experience major supply shocks, such as a bad harvest caused by drought or crop disease. As a result, the CRB index might give misleading signals

about inflation if agricultural prices were to rise sharply because of a supply shock at a time when other consumer prices were stable or decreasing.

### *JOC industrial materials price index*

The *Journal of Commerce* index of industrial materials prices might be a better leading inflation indicator than the CRB index because it is not dominated by agricultural prices. The JOC index, which is compiled by the Center for International Business Cycle Research at Columbia University, tracks the prices of 17 industrial commodities (Table 1). These commodities, while fewer in number than in the CRB index, may be less subject to supply shocks, such as bad harvests, which create volatility in the CRB index. Industrial materials prices also may be a better leading indicator if the demand for such materials is more closely related to the level of current business activity than is the demand for agricultural products.

Industrial materials prices, however, could sometimes give misleading signals about future inflationary pressures. For example, a large shift in household demand away from consumer services toward consumer goods might make the industrial sector substantially stronger than the rest of the economy, causing industrial materials prices to rise at a time when other prices are relatively stable or even declining.<sup>2</sup> Temporary shortages of one or two commodities also might be severe enough to cause a large increase in a broad commodity price index even though most commodities are in ample supply. Thus, even an index of industrial materials prices will probably not be a perfectly reliable indicator of inflation.

### *CIBCR leading inflation index*

Because commodity prices are not perfectly reliable inflation indicators, financial market participants and policymakers may wish to monitor a

composite index combining several economic variables that tend to move up or down before the general inflation rate. In addition to commodity prices, such variables might include measures of economic slack or variables providing an early warning of major supply shocks. Such a composite index may be less likely to give a false signal of general inflationary pressures because of demand or supply disturbances that are specific to the commodity markets.

The pioneering work on composite leading indicators of inflation was done by Geoffrey Moore and his associates at Columbia University's Center for International Business Cycle Research. The CIBCR leading inflation indicator has recently included seven components (Table 1).<sup>3</sup> The components were selected based on their theoretical relevance and their historical record in predicting cyclical peaks or troughs in consumer price inflation. The first three components are the ratio of employment to the population, the JOC industrial materials price index, and the growth rate of domestic nonfinancial debt. These components reflect "the intensity of demand pressures in the labor market, in the commodities markets, and in the capital markets" (Moore and Kaish). Another component is the change in nonfuel import prices, which reflects prices that are especially sensitive to fluctuations in the foreign exchange value of the dollar.

The remaining components of the CIBCR index are derived from surveys of business executives. The percent of businesses expecting higher selling prices comes from a Dun and Bradstreet survey of nonfinancial firms. The last two components are from a monthly survey by the National Association of Purchasing Management (NAPM). The price diffusion component measures the percent of manufacturers experiencing higher prices for materials they purchase. The vendor performance component reflects how quickly suppliers are able to make deliveries. Slower deliveries may imply that economic slack is diminishing, which may put upward pressure on consumer price inflation in the future.

Even a composite leading indicator of inflation is unlikely to be totally accurate. The choice of components for a composite index is based on past inflationary experience, yet the primary causes of inflation may differ over time. As a result, movements of a leading indicator might be misleading if the index does not give enough weight to components reflecting the current causes of inflation. In the extreme case, a composite index might miss an inflation upturn altogether if the inflationary pressures are caused by a factor that was unimportant in the past.

### *PaineWebber leading inflation index*

Another example of a composite leading indicator is the PaineWebber leading inflation index, which is designed to anticipate turning points in consumer price inflation by about 12 months. There are seven components of the PaineWebber indicator (Table 1). Although some components of the PaineWebber and CIBCR indexes overlap, the two leading indicators differ in important ways. Both composite indexes include the NAPM price diffusion and vendor performance series. Industrial materials prices also play an important role in both composite indexes, but the PaineWebber indicator uses a CRB spot index of industrial materials prices rather than the JOC index. The PaineWebber indicator also includes demand pressures in the labor market but measures these pressures by the unemployment rate rather than the employment-population ratio. The PW indicator includes the trade-weighted foreign exchange value of the dollar as a measure of international influences rather than the import price index in the CIBCR indicator.

The PaineWebber indicator also may give greater emphasis to inflationary disturbances originating on the supply side of the economy. The PW index includes oil prices and agricultural prices as separate components. Oil prices were a major contributor to rising inflation in 1973-74, and again in 1979 when foreign oil producers curbed their output

and raised oil prices dramatically. Supply-induced shortages of agricultural products have also worsened consumer price inflation at times. Yet like the CIBCR index, the PaineWebber leading indicator may not predict future inflation accurately if its components do not adequately reflect the current primary causes of inflation.

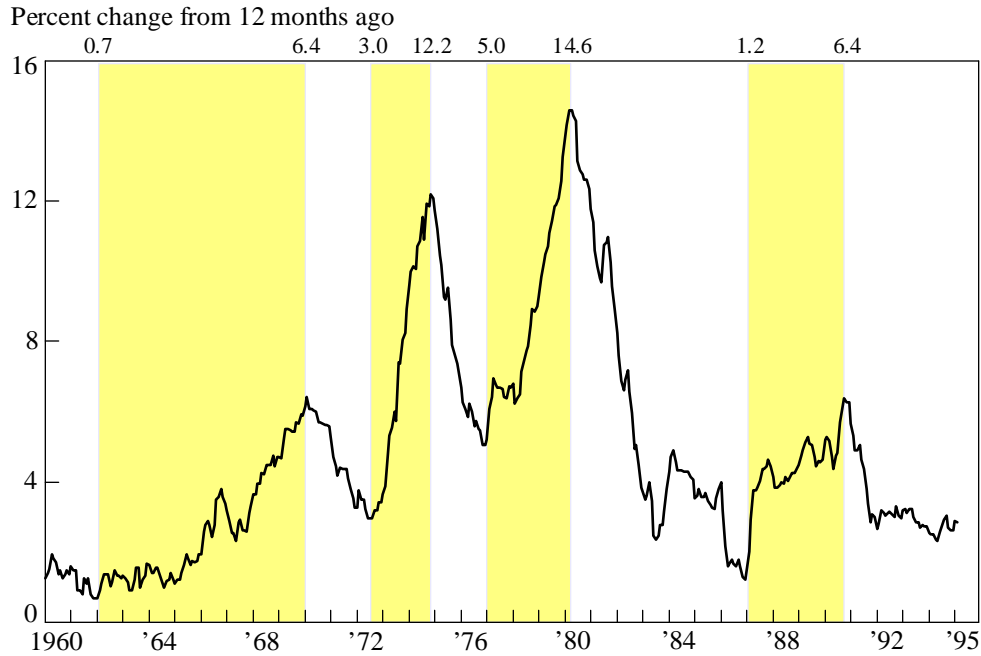
### *EMPIRICAL EVIDENCE*

The previous discussion explained why the price of gold, broad-based commodity price indexes, and composite indexes might be useful leading indicators of consumer price inflation. Theoretical arguments also suggest these indicators might sometimes be misleading because of market-specific shocks to commodity markets, an improper weighting of components, or a false increase in inflation expectations. Empirical evidence is needed to more fully assess the usefulness of such leading indicators to financial market participants and policymakers. Two kinds of empirical evidence will be considered: a turning point analysis focusing on the timing of sustained upward or downward movements in the inflation rate, and a regression analysis designed to predict the magnitude of future inflation.

#### *Behavior at turning points*

The leading indicator approach to forecasting has emphasized the prediction of turning points rather than the prediction of inflation magnitudes. Previous research has found that leading inflation indicators typically signal major inflation peaks and troughs, but sometimes also give false signals of a turning point. For example, Roth evaluated the turning point signals of five leading inflation indicators from 1948 to 1986. Roth found composite indexes provide more reliable signals of inflation peaks and troughs than a commodity price index. The composite indexes signaled every turning point

*Chart 1*  
**Consumer Price Inflation**



Source: U.S. Department of Labor.

in CPI inflation and gave fewer false signals of an inflation peak or trough than did the JOC index of industrial materials prices.<sup>4</sup>

Further turning point analysis is desirable, however, because additional data have become available since Roth's study, and because Roth did not evaluate the price of gold. The first step in the process is to identify peaks and troughs in consumer price inflation. Because no generally accepted dating of inflation turning points is available, peak and trough dates were selected for this article based on an inspection of past CPI inflation rates. Chart 1 shows consumer price inflation, measured by the percent change in the consumer price index (CPI) from 12 months earlier. The shaded areas represent periods of rising consumer price inflation, with peak and trough inflation rates shown across the top

of the chart. The exact months for the inflation peaks and troughs are shown in Table 2.<sup>5</sup>

An informal evaluation of turning point predictions is possible with Chart 2. Each panel of the chart shows one of the leading inflation indicators described earlier with shaded regions marking the episodes of rising CPI inflation. Chart 2 shows 12-month growth rates for the three commodity price indexes and levels of the CIBCR and PW indexes.

Gold prices have tended to signal past inflation upturns, but have also fluctuated erratically in ways that might be misleading to financial market participants and policymakers. The price of gold is plotted in the first panel of Chart 2 only back to 1970 because the price of gold was previously fixed by the international monetary system.<sup>6</sup> The 12-month

*Table 2*  
**Turning Points in the CPI Inflation Rate**

Inflation trough		Inflation peak		Percentage point increase
Month	Inflation rate	Month	Inflation rate	
Nov. 1961	.7	Feb. 1970	6.4	5.7
Aug. 1972	3.0	Nov. 1974	12.2	9.2
Dec. 1976	5.0	Apr. 1980	14.6	9.6
Dec. 1986	1.2	Oct. 1990	6.4	5.2

Note: Inflation is measured by the percent change in the CPI from 12 months earlier.

growth rate of gold prices always rose before the shaded inflationary episodes. However, the growth rate was negative—that is, gold prices were falling—before the 1976 inflation trough, giving an inflation signal that many forecasters would have found unconvincing at the time. Gold prices also fluctuated substantially during the 1972-74 inflation upturn. During this period, the sharp declines in the 12-month growth rate of gold prices could easily have misled forecasters into thinking an inflation peak was close at hand.

The two broader commodity price indexes also tended to lead the inflation cycle, but with erratic fluctuations that were potentially misleading to financial market participants and policymakers. For example, the 12-month growth rate of the CRB index historically started rising before inflation troughs, but the growth rate was negative at the December 1986 inflation trough. The level of the CRB index, therefore, was still declining at the time of the inflation upturn. Forecasters who were looking for an actual rise in the index thus received a confirming signal only after the inflation upturn had already occurred.

In contrast, the levels of the two composite

leading indicators turned up before peaks, and down before troughs, in the CPI inflation rate. As is true for the commodity price indexes, however, the amount of time by which movements in the CIBCR index or the PW index preceded movements in consumer price inflation was variable from one inflation cycle to the next. For example, the PW index peaked near the middle of the 1972-74 inflation upturn, but the index peaked at the very end of the 1986-90 inflation upturn. Such variable lead times hamper the usefulness of leading inflation indicators.

Although the leading indicators have not been perfectly reliable, these indexes have often given early warning signals of inflation turning points. Moreover, even when the signals came slightly after the turning points, such signals may have helped analysts confirm that a turning point occurred. Such confirming signals are useful since recognizing a turning point may be difficult in practice because of data lags and inflation measurement problems. Leading inflation indicators, therefore, can be useful in forecasting or confirming turning points despite occasional false signals and variable lead times.

While the analysis conducted here does not

Chart 2

**Five Leading Indicators of Inflation**

Percent change from 12 months ago

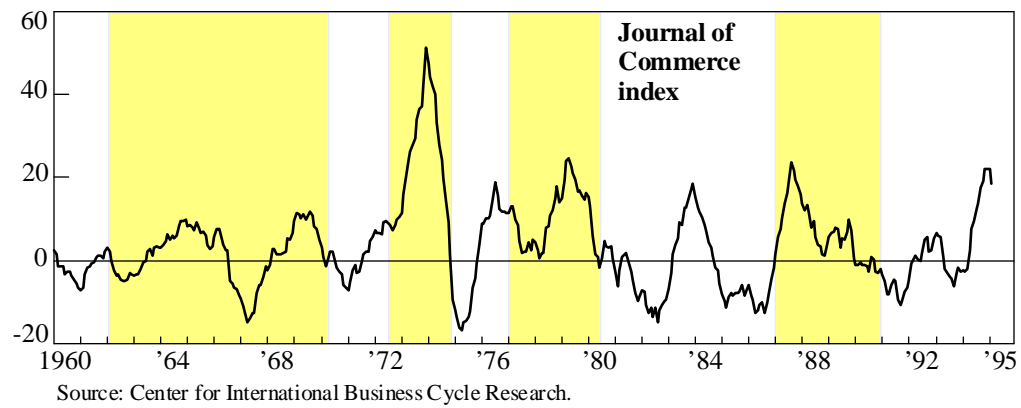
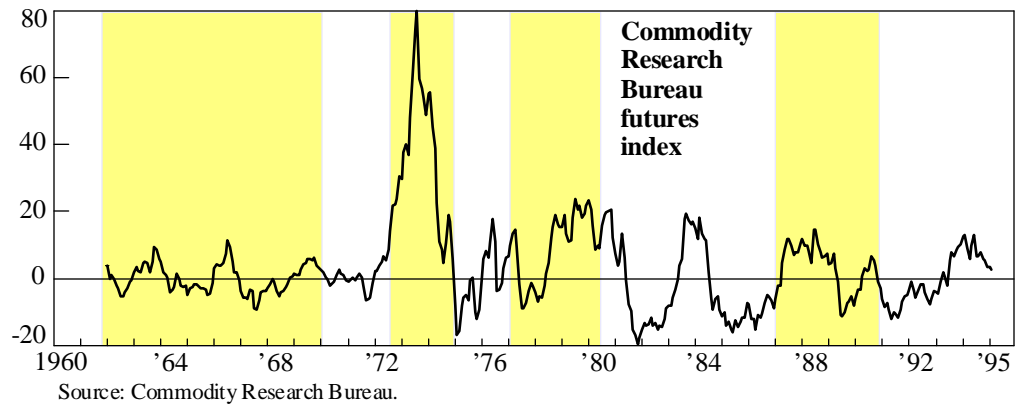
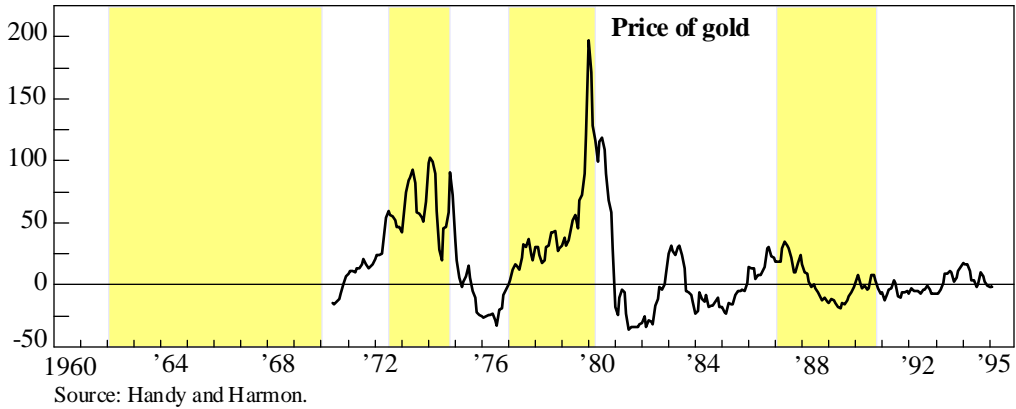
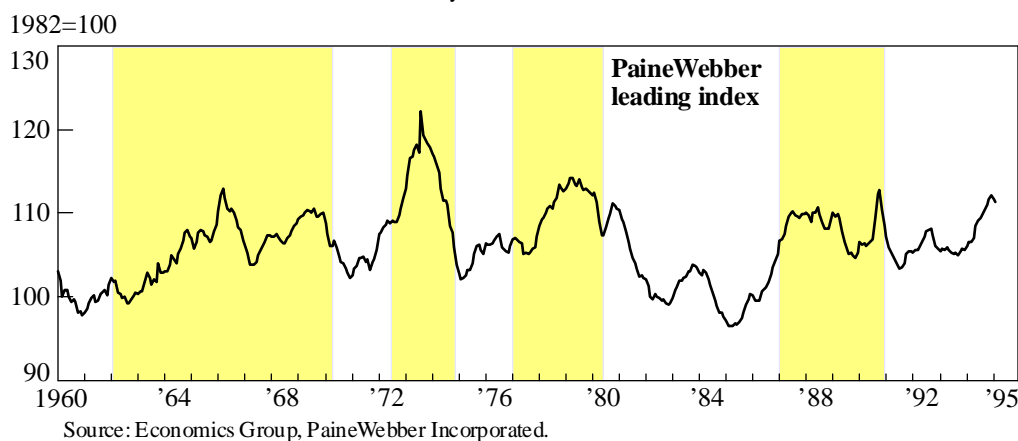
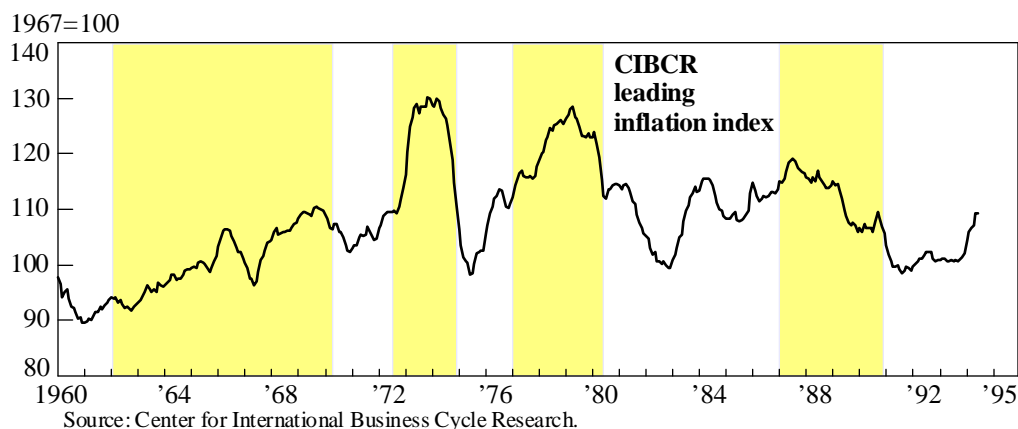




Chart 2 (continued)

### Five Leading Indicators of Inflation



provide a ranking of the five leading indicators, theoretical reasoning and previous research suggest the composite indexes are generally more reliable than commodity prices alone. Theoretical reasoning showed that composite indexes are less likely to give false signals of turning points because the composite indexes are more diversified than the other indexes. Roth's empirical research also found that composite indexes gave fewer false turning point signals. A good historical performance, however, does not guarantee future reliability because the structure of the economy may change over time.

### Regression analysis

Financial market participants and policymakers are interested not only in inflation turning points but also in the magnitude of future inflation. Although the leading indicator approach has focused on predicting peaks and troughs, it is natural to ask whether such indicators can also predict inflation magnitudes. As a result, regression equations are estimated to determine how well each indicator—taken by itself—explains subsequent CPI inflation. The analysis then considers whether these indicators

could add useful information to a standard economic model that relates consumer price inflation to past inflation and economic slack.

Much of the variation in future CPI inflation cannot be explained by a single leading indicator. Table 3 summarizes two forecasting experiments in which CPI inflation is explained by a single leading indicator. The first two columns of the table consider an experiment in which inflation over a future 12-month period is explained by the change in commodity prices over the last 12 months or by the level of the CIBCR or PW index. The statistics show the percent of variation in future CPI inflation explained by the single indicator variable. For comparison, the last row of the table shows how much of the future inflation is explained by consumer price inflation over the previous 12 months, making no use of information from any of the five leading indicators.

Although all of the leading indicators leave a large part of the variation in future inflation unexplained, the composite indexes perform best over 1973-94. The CIBCR index explains 60 percent of the variation in future CPI inflation, and the PW index explains 54 percent. The other leading indicators explain less than half of the variation in CPI inflation. Only the CIBCR and PaineWebber indexes predict future inflation better than past CPI inflation over this period.

The leading inflation indicators have even less explanatory power over the shorter 1983-94 period. This period was marked by a lower and more stable inflation rate than in the 1970s and early 1980s. Supply shocks to the agricultural and crude oil markets also played less of a role in the inflationary process during 1983-94. The second column shows that all of the leading indicators explain less of the variation in future CPI inflation for 1983-94 than for 1973-94 as a whole. The price of gold, the CIBCR index, and past CPI inflation experience notable declines in predictive power. Although the PW and JOC indexes perform best, these indicators leave about 80 percent of the variation in future CPI inflation unexplained.

A different forecasting experiment is summarized

in the last two columns of Table 3. In this experiment, one-month ahead CPI inflation is explained by month-to-month movements of the inflation indicators over the previous 12 months. The composite indexes again perform better than the other leading indicators for 1973-94, although neither composite index predicts better than past CPI inflation. For 1983-94, the explanatory power of all the indicator variables again drops substantially. The PW composite index performs slightly better than the other leading indicators but not as well as past CPI inflation.

The results in Table 3 provide a cautionary note about using leading indicators, by themselves, to predict the magnitude of future CPI inflation. The leading indicators leave much of the variation in consumer price inflation unexplained for the 12-month and one-month forecast horizons. The CIBCR index and the PW index generally performed better than the commodity price indexes but still explained poorly the magnitude of inflation in recent years.

Many financial market participants and policymakers may, however, be more interested in whether a leading indicator adds any additional information to a standard economic model of inflation. Most economists believe that economic slack is a key fundamental determinant of the inflation rate. Two alternative measures of slack are considered here—the civilian unemployment rate and the manufacturing capacity utilization rate.<sup>7</sup> Lagged CPI inflation was also included to account for sluggish price adjustment and the influence of prevailing inflation expectations on price and wage bargaining.

Table 4 presents some tests of whether the five leading inflation indicators contain additional predictive information.<sup>8</sup> The tests consider whether adding a leading indicator to the standard economic model improves CPI inflation forecasts. Some tests also examine whether a leading indicator adds useful information to a forecast based solely on lagged CPI inflation for the last 12 months. Two periods are considered, 1973-94 and 1983-94. A leading inflation indicator contains additional predictive

Table 3

**Explanatory Power of Leading Inflation Indicators***(Percent of inflation variation explained)*

	12-month change		Distributed lag	
	1973-94	1983-94	1973-94	1983-94
Price of gold	.43	.02	.25	.09
CRB index	.41	.13	.24	.07
JOC index	.37	.21	.20	.09
CIBCR index	.60	.15	.45	.09
PW index	.54	.19	.39	.17
Past CPI inflation	.48	.01	.54	.23

Note: This table gives  $R^2$  statistics from various regression models. In the first two columns, the dependent variable is a simple percent change in the CPI from month  $t$  to month  $t+12$ . The explanatory variables are either the simple percent change in commodity prices or the CPI from month  $t-12$  to month  $t$  or the level of a composite index in month  $t$ . In the last two columns, the dependent variable is the monthly change in the CPI. The explanatory variables are a 12-month distributed lag on past monthly changes in commodity prices or the CPI, or past monthly levels of a composite index. All regressions included a constant term.

information if the marginal significance level in the table is less than 0.05, meaning there is less than a 5 percent chance of concluding the indicator adds information when it really does not.<sup>9</sup>

The leading inflation indicators add little useful information to the standard model of inflation. When past CPI inflation is the only other explanatory variable, the leading inflation indicators add predictive information for 1973-94. However, only the CRB futures price index adds information if either the unemployment rate or manufacturing capacity utilization is also included. For 1983-94, none of the leading indicators adds predictive information except for one test involving the price of gold. Thus, even the CRB futures index does not add useful information to the standard economic

model in recent years.

Taken as a whole, the empirical evidence suggests that leading indicators of inflation may have some value to financial market participants and policymakers. The leading indicators often provide signals that help predict or confirm a turning point in consumer price inflation. However, the indicators have signaled inflation turning points with variable lead times and sometimes have given false signals of an inflation peak or trough. Such indicators, by themselves, have not been successful in predicting the magnitude of CPI inflation in recent years. Moreover, the indicators have typically not added useful predictive information to a standard model of consumer price inflation that includes economic slack and past inflation.

*Table 4*  
**Tests for Additional Predictive Information**  
*(Marginal significance levels)*

<i>1973-94 sample period</i>					
<u>Other variables</u>	<u>Leading inflation indicator</u>				
	<u>Price of gold</u>	<u>CRB index</u>	<u>JOC index</u>	<u>CIBCR index</u>	<u>PW index</u>
Lagged inflation	.020	.000	.002	.000	.021
Lagged inflation and unemployment	.065	.040	.188	.126	.358
Lagged inflation and capacity use	.126	.041	.189	.131	.761
<i>1983-94 sample period</i>					
<u>Other variables</u>	<u>Leading inflation indicator</u>				
	<u>Price of gold</u>	<u>CRB index</u>	<u>JOC index</u>	<u>CIBCR index</u>	<u>PW index</u>
Lagged inflation	.198	.839	.755	.662	.272
Lagged inflation and unemployment	.273	.940	.869	.848	.512
Lagged inflation and capacity use	.000	.628	.850	.732	.358

Note: These tests are based on regressions relating the monthly change in the CPI to 12-month distributed lags on past CPI inflation and one of the indicator variables. The commodity price variables are entered as percent changes, and the composite indexes are entered as levels. In addition, some of the regressions included 12-month distributed lags of either the unemployment rate or manufacturing capacity utilization. All regressions included a constant term.

## CONCLUSION

Because the empirical evidence provides only qualified support for the leading indicators of inflation, financial market participants and policymakers should probably use a variety of economic models and indicators to predict CPI inflation. The leading inflation indicators are useful primarily as a signal or confirmation of an inflation turning point. Among the set of leading indicators, composite indexes are likely to provide the most reliable signals

of turning points. But other economic models and statistics can provide more accurate forecasts of future inflation magnitudes.

Given that the leading indicators provide some useful information about future inflation, what are such indicators saying about the current situation? The leading indicators generally gave a warning signal of rising inflationary pressures in 1994 but have turned down slightly in 1995. The price of gold rose in 1993 and early 1994, but stabilized in late 1994 and early this year. As noted earlier, some of

the increase in gold prices may have reflected rising inflation expectations in Southeast Asia and political uncertainties in Russia. The other leading indicators of inflation rose sharply last year, although these indicators have either stabilized or declined slightly so far in 1995. Recent declines in the indicators have been small, however, relative to last year's increases.

Thus, it is too early to conclude with any certainty that upward pressures on the leading indicators have abated. Taken with the evidence of declining economic slack, the leading indicators of inflation justify recent concerns about potential inflationary pressures.

### ENDNOTES

<sup>1</sup> This discussion assumes that the monetary authority does not accommodate the upward shift in the short-run aggregate supply curve caused by the erroneous expectations. Monetary accommodation could produce a self-fulfilling prophecy in which higher inflation expectations, even though based on erroneous information, ultimately lead to a higher inflation rate.

<sup>2</sup> Technological progress also may change the equilibrium price of industrial commodities relative to other goods and services. Technological progress in the postwar era has often reduced the demand for industrial commodities by making products smaller and lighter or by allowing the producer to use cheaper synthetic materials. Many new products, such as computers and software, require little commodity input relative to the value of the product. And, technological advances have helped commodity producers open new sources of supply that previously were not feasible. Reflecting such influences, the relative price of commodities has drifted downward over the long term (Reinhart and Wickham). Such factors may have weakened the link between commodity price movements and the general inflation rate because commodities have become less important in the production process.

<sup>3</sup> The empirical work in this paper was conducted before a recent revision in the CIBCR leading index. Thus, the results may not be fully representative of how the current version of the index would have performed historically. The empirical tests do, however, assess the version of the CIBCR index that received substantial attention in the last two years as concern about future inflationary pressures mounted. The CIBCR index has been revised several other times in the past.

<sup>4</sup> Roth evaluated turning point predictions by Moore's leading inflation index, the Niemira composite index, the Morosani indicator, the JOC index, and the growth rate of the M1 measure of the money supply. The Niemira index was a predecessor of the PaineWebber index, but the current PW index is substantially revised and has more components. The Moore index and the JOC index have also been revised since Roth's study. The Morosani indicator is not considered here

because this indicator is not widely followed by financial market participants or policymakers. The money supply is not considered because M1 has not been a reliable indicator of real activity or inflationary pressures in the 1980s or 1990s. Roth measured consumer price inflation by the six-month smoothed change in the CPI, which gives a somewhat different dating of inflation turning points than the 12-month change used in this article.

<sup>5</sup> An inflation upturn also occurred in 1959 and the first few months of 1960. However, the early months of 1960 are not shaded in Chart 1 or Chart 2 because the charts do not show the full inflationary episode. The higher inflation in late 1983 and 1984 is not classified as an inflation upturn because this rise in the inflation rate "most likely is a statistical artifact" associated with a change in the way the CPI measured homeownership costs (Roth).

Using another price index or another method of computing the percent change might result in different turning points for the inflation cycle. The peak and trough dates in Table 2 are similar to those in PaineWebber, although the exact dates of the inflation turning points sometimes differ by a few months. Unlike PaineWebber, this article does not classify the brief increase of CPI inflation in 1981 as an inflation upturn.

<sup>6</sup> The price of gold is a spot price from Handy and Harmon derived from Tuesday quotes in *The Wall Street Journal*.

<sup>7</sup> Garner (1994) and Weiner provided evidence relating these measures of economic slack to the U.S. inflation rate. Supply shock variables also might be included in a mainstream economic model because most economists agree supply-side variables, such as the price of crude oil, have caused major fluctuations in the inflation rate. Such supply shock variables were not included here to focus on the key role of economic slack. In addition, omitting supply shock variables probably gives the leading indicator variables a better opportunity to add useful information to the mainstream model. Including supply shock variables separately in the regression equations would probably strengthen the finding that the leading indicators do not add useful information to the mainstream model.

<sup>8</sup> Previous research has reached differing conclusions about whether commodity price indexes help predict future inflation. Garner (1989) found commodity price indexes contained information that was useful in predicting CPI inflation. However, these tests did not include the measures of economic slack that are used here and covered substantially different time periods. Branson and Boughton also presented some evidence that commodity prices help predict the general inflation rate. But Fuhrer found a measure of commodity price inflation, by itself, did not significantly improve CPI inflation forecasts.

<sup>9</sup> Table 4 reports marginal significance levels to test the hypothesis that the coefficients of the leading indicator are zero. The number 0.05 is widely used as a criterion for statistical significance, but other analysts might prefer 0.01 or 0.10. The tests for predictive usefulness in Table 3 are described in Granger. Monthly CPI inflation is regressed on 12 lagged values of CPI inflation and 12 lagged values of the leading inflation indicator. Sometimes, the regressions also include 12 lagged values of either the civilian unemployment rate or the manufacturing capacity utilization rate.

### REFERENCES

- Feder, Barnaby J. 1994. "Inflation Concerns Rise with Commodity Prices," *The New York Times*, June 22, pp. C1 and C15.
- Boughton, James M., and William H. Branson. 1991. "Commodity Prices as a Leading Indicator of Inflation," in Kajal Lahiri and Geoffrey H. Moore, eds., *Leading Economic Indicators: New Approaches and Forecasting Records*. Cambridge: Cambridge University Press.
- Fuhrer, Jeffrey C. 1993. "Commodity Prices, the Term Structure of Interest Rates, and Exchange Rates: Useful Indicators for Monetary Policy?" Federal Reserve Bank of Boston *New England Economic Review*, November/December, pp. 18-32.
- Garner, C. Alan. 1989. "Commodity Prices: Policy Target or Information Variable?" *Journal of Money, Credit, and Banking*, November, pp. 508-14.
- \_\_\_\_\_. 1994. "Capacity Utilization and U.S. Inflation," Federal Reserve Bank of Kansas City *Economic Review*, Fourth Quarter, pp. 5-21.
- Granger, C.W.J. 1969. "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica*, July, pp. 424-38.
- Laurent, Robert D. 1994. "Is There a Role for Gold in Monetary Policy?" Federal Reserve Bank of Chicago *Economic Perspectives*, March/April, pp. 2-14.
- Moore, Geoffrey H., and Stanley Kaish. 1983. "A New Inflation Barometer," *Morgan Guaranty Survey*, July.
- PaineWebber. 1995. *Monthly Economic Review*, January 16, p. 5.
- Reinhart, Carmen M., and Peter Wickham. 1994. "Commodity Prices: Cyclical Weakness or Secular Decline?" International Monetary Fund *Staff Papers*, June, pp. 175-213.
- Roth, Howard. 1986. "Leading Indicators of Inflation," Federal Reserve Bank of Kansas City *Economic Review*, November, pp. 3-20.
- Weiner, Stuart E. 1993. "New Estimates of the Natural Rate of Unemployment," Federal Reserve Bank of Kansas City *Economic Review*, Fourth Quarter, pp. 53-69.