

Rising commodities and higher inflation (It's not that simple)

While considered an old standby in most traders' arsenals, the commodity-inflation link may be slipping. Here are the facts behind this theory breakdown.

By Stephan Kudyba and Romesh Diwan

A species must evolve to survive. The same is true for traders. While our fate may not be so dim, financial ruin is a serious and likely outcome if we ignore changes in our environment. Often, we need to step back, assess our surroundings and adapt.

With the recent rapid progress of

technology and globalization, many previously accepted relationships have changed. Enhancements in production efficiency, structural shifts toward the service sector and the growth of multinational corporate business all have assailed traditional market theory.

One such tenet is the notion that rising commodity prices cause an acceleration in the rate of inflation. A popular application of this idea is to sell government securities to "price in" possible monetary tightenings by the Federal Reserve Board because the Commodity Research Bureau (CRB) index is in an uptrend. Such techniques no longer may be valid. It's true this commodity-inflation link thrived from 1975 to the mid-1980s, but, much to the chagrin of inflation hawks and market letter writers, it appears fleeting.

Using ordinary least squares regression analysis, we'll test this hypothesis by addressing the theories of cost-push and demand-pull inflation, with reference to the influence of commodity prices on the U.S. Consumer Price Index (CPI). We will try to determine if accepted beliefs regarding commodities and inflation endure in today's global, computerized, service-oriented society.

Missing link The prevailing theory that commodities are leading indicators for changes in the CPI is based on the notion that the prices of widely traded commodities reflect instantaneous information about expected changes in supply and demand in the economy. These forces can come in the form of weakening or strengthening economic activity, supply shocks or individuals using precious metals to hedge against expected inflation.

While commodity prices may respond immediately, final consumer goods lag because producers are restricted by lengthy contractual agreements and other rigidities.

However, to be a reliable leading indicator of a targeted variable, a logical cause-and-effect relationship must exist between the commodities and the final products. The CPI comprises a variety of commodity inputs, so a cause-and-effect relationship should exist, thus rendering commodities a possible leading indicator for changes in the inflation gauge (see "CPI commodity group," left).

While arguments could be made for the commodity price-CPI link based on the commodity components of the CPI, a formal regression analysis will illustrate the statistical significance of the relationship.

We used the CRB index of 17 commodities as an independent variable to assess the broader inflation scenario and the CRB grains and industrial subindexes to illustrate the influences of separate commodity groupings. We also looked at crude petroleum and spot gold individually to measure the supply shock and hedging effects on the inflation argument. To address the volatile nature of commodity prices and built-in growth pattern of the CPI, the semiannual rate of change of monthly CPI data was regressed on the semiannual rate of change of the independent commodities along with a one- and two-period lag of the independent variable in a second-order lag regression equation. The study covered the period from 1975 through 1996. We separated it into two roughly equal segments to analyze possible changes in the commodity-inflation link.

CPI commodity group

Only indirect relationships can be drawn between the CPI and most commodity prices, such as grains as feed inputs to livestock, or as part of the manufacturing processes of final goods, such as cereal and other foods.

Item	Weight
Commodities (total)	42.87
Food and beverages	17.48
Food at home	10.04
Cereal and bakery products	1.48
Meats, poultry and eggs	3.00
Dairy products	1.25
Fruits and vegetables	1.97
Other food at home	2.34
Sugar and sweets	0.33
Fats and oils	0.25
Nonalcoholic beverages	0.72
Other prepared food	1.04
Food away from home	5.87
Alcoholic beverages	1.57
Commodities less food and beverages	25.39
Nondurables less food and beverages	15.15
Apparel commodities	4.79
Men's and boy's apparel	1.28
Women's and girl's apparel	2.10
Other apparel	1.41
Nondurables less food, beverages, apparel	10.36
Durables	10.24

Note: Numbers may not add up due to rounding.

Source: "CPI Detailed Report 1996," U.S. Department of Labor, Bureau of Labor Statistics

The results of the regression tests suggest an interesting anomaly (see "Missing link?" right). In the earlier period from 1975 through 1986, the various independent commodity variables explained a reasonable amount of change in the CPI.

The most influential independent variable was crude oil as indicated by the strong R² correlation coefficient and significant t-statistics. These results further support the cost-push inflation theory. In addition to its broader-based input effect on manufacturing and production processes, oil also should have had a greater impact on CPI because its price activity consisted of a less-volatile uptrend from the period of 1976-80, along with a similar downtrending move from 1981-86. These prolonged price movements maintained consistent pressure on the prices of final consumer goods and services that may have permitted the full-lag effect to occur in the CPI. (See "Roots of inflation," page 50.)

The next most significant independent variable for the period was spot gold as evidenced by the significant t-statistics and a slightly weaker correlation coefficient than oil's. These results add credence to the hedging theory that flexible gold prices more quickly reflect demand pressures as individuals buy the commodity to hedge expected inflation and liquidate those holdings when inflation appears more tame.

The remaining variables also are potential leading indicators of changes in the CPI, where grains appear to be a bit more reliable than the CRB industrial and CRB index of 17 commodities. Although grain's statistics are somewhat weaker than oil's, they still retain enough significance to suggest they influence the inflation index.

The broader CRB and CRB industrial indexes post a somewhat weaker performance as indicated by their questionable t-statistics. Possibly these variables less directly affect CPI components or, in the case of the industrials, have a more-volatile, less-continuous trend characteristic. That is, price trends within the index may subside before the full lagged effect occurs in the CPI. With the broader CRB index, the influence of more important subcomponents (such as crude oil) may

Missing link?

$CPI_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + u_t$, where

CPI_t is the semiannual rate of change of the CPI.

α is a constant.

β₀, β₁ and β₂ are the regression coefficients.

X_t is the current semiannual rate of change for the independent variable.

X_{t-1} is the semiannual rate of change for the independent variable for six months ago.

X_{t-2} is the semiannual rate of change for the independent variable for one year ago.

u_t is an error term.

Results: Period 1975 to 1986

Crude oil			
R ²	Standard error		
0.8136			0.0088
Variable	Coefficient	t-statistic	
Crude oil	0.0771	5.237	
Crude oil _{lag 1}	0.0717	3.927	
Crude oil _{lag 2}	-0.0040	-0.219	
Spot gold			
R ²	Standard error		
0.7072			0.0110
Variable	Coefficient	t-statistic	
Spot gold	0.0574	3.684	
Spot gold _{lag 1}	-0.0213	-1.149	
Spot gold _{lag 2}	0.0634	4.179	
CRB index			
R ²	Standard error		
0.5277			0.0140
Variable	Coefficient	t-statistic	
CRB index	0.0535	1.237	
CRB index _{lag 1}	0.1120	2.488	
CRB index _{lag 2}	0.0850	1.924	
CRB grains index			
R ²	Standard error		
0.6513			0.0120
Variable	Coefficient	t-statistic	
CRB grains index	0.0546	2.026	
CRB grains index _{lag 1}	0.1066	3.986	
CRB grains index _{lag 2}	0.0507	1.821	
CRB industrials index			
R ²	Standard error		
0.5251			0.0140
Variable	Coefficient	t-statistic	
CRB industrials index	0.0490	1.442	
CRB industrials index _{lag 1}	0.0210	0.535	
CRB industrials index _{lag 2}	0.0863	2.502	
Results: Period 1986 to 1996			
Crude oil			
R ²	Standard error		
0.3802			0.0048
Variable	Coefficient	t-statistic	
Crude oil	0.0187	3.010	
Crude oil _{lag 1}	0.0086	1.588	
Crude oil _{lag 2}	0.0058	1.002	
Spot gold			
R ²	Standard error		
0.1323			0.0057
Variable	Coefficient	t-statistic	
Spot gold	-0.0431	-1.466	
Spot gold _{lag 1}	0.0155	0.424	
Spot gold _{lag 2}	-0.0074	-0.247	
CRB index			
R ²	Standard error		
0.0102			0.0061
Variable	Coefficient	t-statistic	
CRB index	-0.0016	-0.042	
CRB index _{lag 1}	0.0157	0.381	
CRB index _{lag 2}	-0.0020	-0.055	
CRB grains index			
R ²	Standard error		
0.0025			0.0061
Variable	Coefficient	t-statistic	
CRB grains index	-0.0024	-0.208	
CRB grains index _{lag 1}	0.0005	0.043	
CRB grains index _{lag 2}	-0.0008	-0.064	
CRB industrials index			
R ²	Standard error		
0.0385			0.0060
Variable	Coefficient	t-statistic	
CRB industrials index	0.0195	0.776	
CRB industrials index _{lag 1}	0.0002	0.011	
CRB industrials index _{lag 2}	0.0095	0.395	

be muted by adverse price movements of less-influential components. Simply, the index may incorporate too many commodities to be a reliable indicator.

Theory breakdown This analysis is most interesting when it covers the period from 1986 to 1996. When keeping the parameters of the regression study consistent, all correlation coefficients and corresponding t-statistics of non-oil commodity

Connection: Fact Or Fable? Federal Reserve Bank of New York Economic Policy Review, October 1995). The dropping of the commodity weighting in the Bureau of Labor Statistics' CPI to just more than 42 in 1996 from 58 in 1980 is another factor. And according to the International Monetary Fund's May 1997 World Economic Outlook, the value added in manufacturing as a share of GDP in current prices fell to about 17% by 1994 from roughly

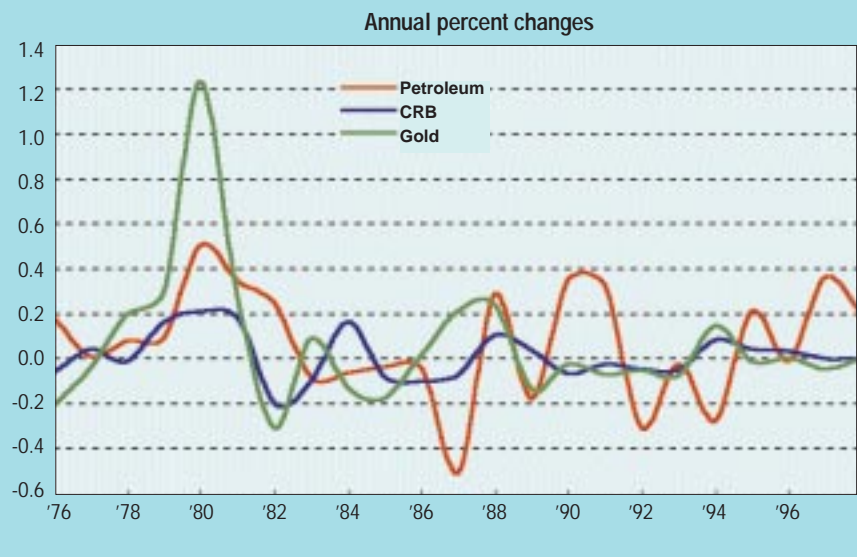
A new market Because economies evolve, investors must constantly evaluate various market links, whether economic or political in nature. Popular examples that illustrate this notion are the weakening influence of U.S. money supply and merchandise trade figures on shorter-term volatility in the forex and interest rate markets. In the early 1980s, many market players focused on money supply figures to formulate their investment strategies, and in the mid- to late-1980s merchandise trade figures dominated the scene. Although these series remain essential economic indicators, they have lost much of their market-moving punch.

The high technology, information and service attributes of today's U.S. economy indeed differ from those of the economies of the 1950s and 1960s. Greater numbers of more accessible international capital markets, increased trade and high-tech information systems have increased globalization and productivity, altering attributes of domestic economies. This new U.S. economy has helped alter the cause-and-effect relationship between commodity prices and the rate of inflation.

Should commodities be ignored when seeking leading indicators for changes in the CPI? Of course not. But we should examine their price movements in context of the bigger picture, and consider more prolonged and extreme trends in select commodities or commodity indexes. The high inflation of the mid-1970s to early 1980s was due to a trend in crude oil that lasted from 1973-81 and pushed prices from about \$3 per barrel to more than \$30 — nearly a 1,000% increase. Mere cyclical price swings of 10% to 25%, as seen in gold in 1993 and the 1995 soybean squeeze, can have little to no affect on inflation. FM

Roots of inflation

The more erratic changes in these key commodity price measures since the mid-1980s have lessened their significance as reliable inflation gauges.



groups fall to insignificant levels. Even in the case of the stronger independent variable of crude petroleum, it can be argued its influence on inflation was negligible.

That the U.S. economy has changed significantly over the past few decades is a likely culprit for this theory breakdown. For example, there is a strong decline in the commodity composition of U.S. output. A study by John Rosine from the Federal Reserve System Working Papers concludes that consumption of spot commodities as a share of nominal gross domestic product (GDP) dropped to about 4% by 1986 from 8% to 10% in 1973-81. Further, consumer demand has shifted its emphasis to sectors with less of a commodity base, such as financial, high-tech and services sectors (see "The Commodity-Consumer Price

27% in the late 1960s, while the value added in services over the same period increased to about 73% from 60%.

Enhancements in overall business activity, such as management and productivity processes, and expanding globalization in manufacturing facilities have enabled producers to manage input costs more accurately while increased competition has kept many from increasing consumer prices. With regard to the breakdown of gold as an inflation hedge, factors such as recent increased central bank sales of the yellow metal may have adversely affected market price activity. As reported by Reuters on July 23, 1997, Federal Reserve officials Laurence Meyer and Alice Rivlin asserted that activity in gold prices should not be heavily weighted as an inflation target.

Stephan Kudyba, currently in the economics Ph.D. program at Rensselaer Polytechnic Institute in Troy, N.Y., has traded and managed funds in the forex and fixed income markets at Citicorp Investment Bank in New York and Dresdner Bank AG in Frankfurt. Romesh Diwan, a former consultant to the United Nations, is professor of economics at Rensselaer Polytechnic Institute and has written several books and articles on economics, productivity and competitiveness.