Relating Commodity Prices to Underlying Inflation: The Role of Expectations

by J. Scott Davis

> *If the central bank loses control of inflation expectations, a temporary increase in headline inflation can heighten long-run inflation expectations, and an otherwise short-lived commodity price spike will feed underlying core inflation.*

Temporary supply factors may boost some commodity prices—a drought in the Midwest can jolt food costs, or a conflict in the Middle East might propel oil higher. These, in turn, can increase the overall consumer price index (CPI) and the headline inflation rate.

Because central bank anti-inflation measures sometimes take a long time to affect prices, policymakers don't necessarily react to short-term fluctuations in headline inflation (an overall rate that's not seasonally adjusted). In fact, the mandate of many inflation-targeting central banks is to aim to keep headline inflation at a certain target or within a certain range "over the medium term," widely recognized as a few years. Thus, even a strict inflation-targeting central bank doesn't aim to contain short-run headline inflation fluctuations.

Still, fluctuations in headline inflation due to temporary commodity price increases may not be transitory. If a rising headline rate is factored into longer-run inflation expectations, temporary commodity surges may produce a more permanent increase in underlying core inflation—the closely watched rate that excludes categories such as food and energy that are subject to wide swings.

A major development in the theory and practice of central banking occurred during the second half of the 20th century: improved understanding of inflation expectations and their role in price setting. When businesses set prices that will remain fixed for an extended period, they must factor in not only input costs today, but also those expected in the future. Similarly, when workers sign multiyear labor contracts, they must anticipate future costs of living during the life of the agreement.

If the central bank loses control of inflation expectations, a temporary increase in headline inflation can heighten long-run inflation expectations,

and an otherwise short-lived commodity price spike will feed underlying core inflation. But when inflation expectations remain anchored, a temporary headline inflation fluctuation will not feed into the underlying core rate. Food or energy price spikes of limited duration won't matter.

Commodity Spikes and Core Inflation

The post-World War II macroeconomic history of the United States has witnessed both phenomena. Chart 1A depicts the paths of core and commodity price inflation in the U.S. since the late 1950s. The Fed lost credibility and control of inflation expectations during the 1970s. The chart shows how core inflation closely trailed commodity price inflation in the 1970s, particularly after the oil price shocks of 1973 and 1979.

It has been widely noted that beginning in 1979, under Fed Chairman Paul Volcker, the central bank regained its lost credibility. Since the mid-1980s, core inflation has been unresponsive to temporary commodity price fluctuations, which appear to revert to the underlying core rate after spiking, Chart 1A also shows.

We can quantify the extent to which core inflation follows commodity price inflation (or vice versa) by examining the relationship of changes to each and the gap between them (*Table 1*).[1]

In particular, suppose that the current rate of commodity price inflation exceeds the core inflation rate by 1 percentage point (perhaps due to a spike in commodity prices). On average, does a gap of that sort predict an increasing core inflation rate over the coming months, and if so, by how much? If the effect is close to a 1-percentage-point increase in the core rate, the gap will narrow mainly as a result of core inflation catching up to commodity price inflation. If the effect is close to zero, core inflation tends not to respond to commodity price inflation spikes.

At the same time, what effect, on average, does the same 1-percentage-point difference have on the future commodity price inflation rate? Does the gap predict a decline in the rate of commodity price inflation over coming periods, and if so, by how much? If that effect is close to a 1-percentage-point decline in the rate of commodity price inflation, the gap will narrow mainly as a result of commodity price inflation reverting to the core inflation rate.

The estimates show there is a major difference in the relationship between commodity price inflation and core inflation in the pre- and post-Volcker Feds. In the 1957–79 period,
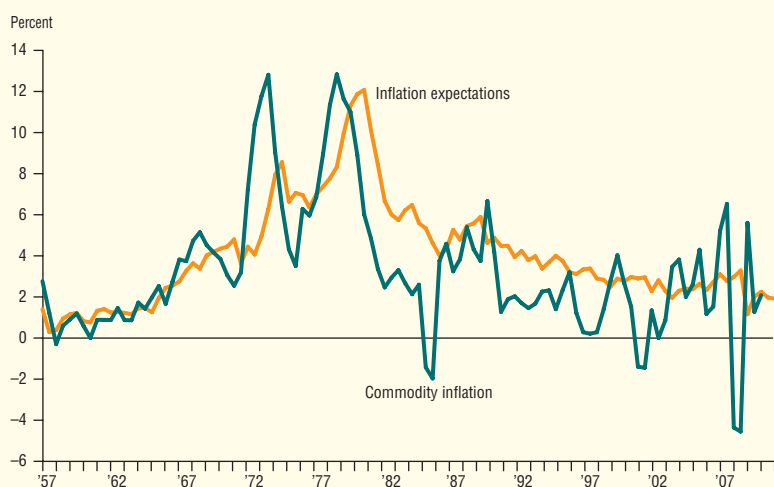
Chart 1
Commodity Price Inflation's Effect on Core Inflation, Inflation Expectations

A. Commodity and Core Relationship Changes Around 1980

Percent

Core inflation

Commodity inflation
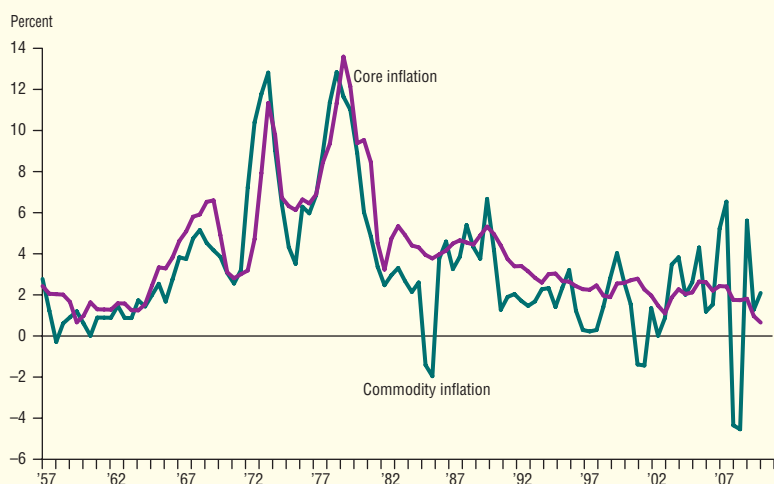
B. Commodity and Inflation-Expectations Relationship Changes Post-1980

Percent

Inflation expectations

Commodity inflation

SOURCES: Haver Analytics; Bureau of Labor Statistics; Federal Reserve Bank of Philadelphia.

the effect of the commodity–core gap on subsequent core inflation is positive and statistically significant, while the impact on subsequent commodity price inflation is not significantly different from zero. This implies that during the 1960s and 1970s, core inflation tended to follow commodity price inflation, while commodity price inflation did not revert to underlying core inflation. The estimated effect on core inflation implies that if commodity price inflation exceeds core inflation by about 1 percentage point, core inflation would be expected to rise by a half-percentage point in the next six months.

This pattern is reversed in the post-1984 period. Now the estimated effect of the gap on core inflation is not significantly different from zero, and the estimated effect on commodity price inflation is negative and significant. Core inflation is unresponsive to fluctuations in commodity price inflation, and deviations in commodity price inflation tend to revert to the underlying core rate.

Commodity Prices and Expectations

A change in the relationship between commodity price fluctuations and inflation expectations lies behind this abrupt shift in the relationship between commodity and core inflation.

Since commodities are usually traded in perfectly competitive markets—featuring an abundance of buyers and sellers where no single entity dominates—prices are very flexible. By comparison, prices in the core CPI—the headline rate, less volatile food and energy components—tend not to move as easily, or are "stickier," in economics parlance. Expectations of future prices matter when a price is set and will remain fixed for a period of time.

Thus, a temporary shock to commodity prices can lead to higher inflation expectations, which are incorporated into the price- and wage-setting process. This process is also referred to as the "second-round effect." In the first round, the commodity price shock causes a temporary increase in headline inflation; in the second round, inflation expectations can become entrenched, and even a temporary shock to commodity prices can produce a persistent increase in the core rate.

Commodity price inflation's impact on overall inflation expectations determines the strength of the second-round effects and, consequently, the extent to which commodity price fluctuation drives the underlying core rate.

The paths of commodity price inflation and one-year-ahead infla-

tion expectations, as calculated by the Federal Reserve Bank of Philadelphia's Livingston Survey, are depicted in Chart 1B. As we should expect, the path of inflation expectations is similar to the path of core inflation in the chart. Both were high and variable in the 1970s, with spikes following the 1973 and 1979 oil price shocks, and have steadily decreased since the mid-1980s.

The plots of commodity price inflation and inflation expectations seem to suggest that before 1979, a commodity price increase led to rising inflation expectations about a year later. Since the mid-1980s, this pattern has no longer held, and inflation expectations seem relatively unresponsive to commodity price fluctuations.

It's possible to quantify the extent to which inflation expectations follow commodity prices (or vice versa), just as we did with respect to core inflation. In this case, imagine that the rate of commodity price inflation exceeds the current rate of expected inflation by 1 percentage point. Does expected core inflation subsequently rise, and if so, by how much? Or does commodity price inflation subsequently fall back toward the expected core rate?

If the estimated effect on expected inflation is close to 1 percentage point, fluctuations in commodity price inflation—even temporary ones—are incorporated into inflation expectations. If the effect is close to zero, inflation expectations are unresponsive to commodity price movements.

As before, we can divide the data into pre-1979 and post-1984 samples. In the pre-1979 data, a 1-percentage-point excess of commodity price inflation over expected inflation predicts a nearly 0.2-percentage-point increase in expected inflation over the next six months (*Table 2*).[2] Thus, there is a tendency for inflation expectations to "catch up" with commodity price inflation in the earlier sample. At the same time, the effect of the gap on subsequent commodity price inflation doesn't differ in a statistically signifi-

Table 1

Measuring the Impact of Changes to Commodity and Core Inflation

Effect of 1-percentage-point difference between the commodity price inflation rate and core inflation rate on subsequent core and commodity price inflation:

	1960–79	1984–2007
Change in core inflation rate	0.488*	0.029
Change in commodity inflation rate	0.187	−0.546*

* Statistically significant at the 5 percent level.

NOTES: The effects are estimated from regressions using U.S. Consumer Price Index data sampled at a six-month frequency. Changes in inflation rates are between current rates and rates six months in the future.

Table 2

Commodity Inflation Impact on Price Expectations Evolves

Effect of 1-percentage-point difference between the commodity price inflation rate and the expected inflation rate on subsequent expected inflation and commodity price inflation:

	1960–79	1984–2007
Change in expected inflation rate	0.188*	0.078*
Change in commodity inflation rate	−0.064	−0.489*

* Statistically significant at the 5 percent level.

NOTES: The effects are estimated from regressions using U.S. Consumer Price Index and Livingston Survey data sampled at a six-month frequency. Changes in inflation rates are between current rates and rates six months in the future.

cant way from zero, implying no tendency for commodity price inflation to revert to expected inflation.

Results from the post-1984 sample show the gap still predicts a statistically significant effect on inflation expectations—so there is still some tendency for inflation expectations to catch up with commodity price inflation—but the size of the effect is much smaller. Also, the estimated impact on subsequent commodity price inflation is negative and significant, implying that fluctuations in commodity price inflation will tend to quickly fall back to the underlying expected inflation rate.

These calculations show that because of changing expectations, core inflation that in the 1970s reacted so strongly to fluctuations in commodity price inflation responds very little today. In the 1970s, the public was quick to change its outlook for future inflation in response to temporary commodity price shocks. However, in more recent decades, expectations have been largely unresponsive to commodity prices. This change is particularly significant as workers and businesses set prices that reflect not only current costs but also those in the future.

Thus, inflation expectations form the link between temporary fluctuations in commodity prices and underlying core inflation. If the Federal Reserve is able to anchor inflation expectations and prevent them from rising following a commodity price shock, it successfully breaks the link between commodity prices and core inflation.

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Notes

[1] Standard errors for the regression results are as follows: For the effect on core inflation, the standard error is 0.099 in the earlier sample and 0.025 in the later sample. For the effect on commodity price inflation, the standard error is 0.143 in the earlier sample and 0.157 in the later sample.

[2] For the effect on expected inflation, the standard error is 0.036 in the earlier sample and 0.026 in the later sample. For the effect on commodity price inflation, the standard error is 0.108 in the earlier sample and 0.139 in the later sample.