

# FRBSF ECONOMIC LETTER

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## Oil Price Shocks and Inflation

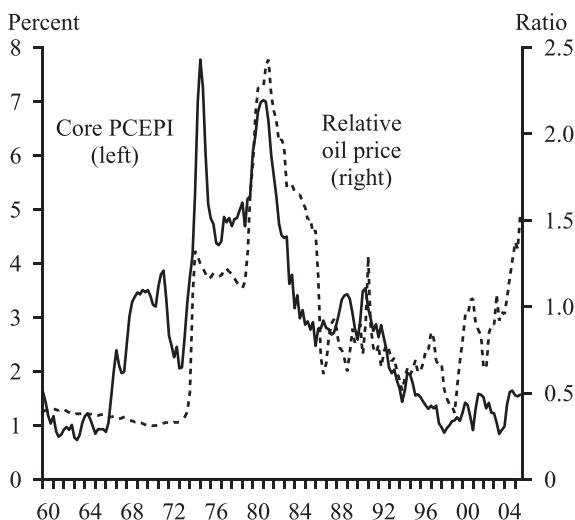
Oil prices have risen sharply over the last year, leading to concerns that we could see a repeat of the 1970s, when rising oil prices were accompanied by severe recessions and surging inflation. This *Economic Letter* examines the historical relationship between oil price shocks and inflation in light of some recent research and goes on to discuss what the recent jump in oil prices might mean for inflation in the future.

### The historical record

Figure 1 plots the price of oil relative to the core personal consumption expenditures price index (PCEPI) together with the core PCEPI inflation rate. (Core measures of inflation exclude food and energy prices.) The figure shows that the price of oil jumped sharply twice in the 1970s, as did inflation. But this relationship appears to have deteriorated over the latter part of the sample; for example, when oil prices fell sharply in the mid-1980s, core inflation appears to have been unaffected. Similarly, the last part of our sample shows a sustained increase in the relative price of oil that does not appear to be reflected in inflation.

Hooker (2002) provided formal evidence of this change in the relationship between oil prices and inflation over the 1962–2000 period. His model used the rate of change of oil prices, the unemployment gap (which is the prevailing unemployment rate relative to a benchmark known as the natural rate of unemployment) and lagged inflation to predict core PCE inflation. Statistical tests found a break in the estimated relationship among these variables at the end of 1980. When he allowed this relationship to differ between the periods 1962–1980 and 1981–2000, he found that oil prices had a significant impact on inflation in the earlier period, but not in the later period. This result did not change when he used other measures of inflation (specifically, either the core CPI or the chain-weighted GDP price index), other measures of resource utilization, or other measures of fuel and energy costs. Changes in the hypothesized relationship between oil prices and inflation (such as allowing oil price increases to affect the economy differently from oil price decreases) did not matter either. It is worth noting that

**Figure 1**  
Inflation and the relative price of oil



Note: The relative price of oil is the ratio of the price of oil to the core PCEPI.

Hooker's results—that is, that oil price shocks fail to predict inflation over the post-1980 period—also hold even when the sample is extended to include data through early 2005.

Does this mean that oil shocks no longer matter for inflation? The answer depends upon what's behind the observed change in the relationship. For instance, if Hooker's finding is the result of a change in the conduct of monetary policy, then policymakers need to make sure that they do not respond as they did in the 1970s. By contrast, if it is the result of a permanent change in the structure of the economy, then there is no reason to worry about the effect of oil prices on inflation anymore. Hooker examined several kinds of structural change, including the substantial decline in the energy intensity of the economy since the 1960s and deregulation in the energy sector, but found that these developments did not help explain the change in the relationship between oil prices and inflation.

### The role of monetary policy

To see what role policy might play, assume that we lived in a world where oil was a substantial input to the economy and where a large increase

in the price of oil led to a large increase in costs for a substantial share of firms in the economy. Even here, the Fed could choose to prevent these increases from showing up in core prices by a sufficient tightening of policy. Thus, the finding that oil shocks no longer have much impact on inflation could reflect a much more vigorous response by the Fed to offset the effects of oil shocks on inflation. Hooker examines this possibility by estimating a version of a model constructed by Bernanke, Gertler, and Watson (1997) to study the interaction between oil shocks and monetary policy. He finds that the Fed actually has responded *less* to oil price shocks since the beginning of the 1980s.

While a changed policy response to oil shocks does not appear to be the explanation, other aspects of policy have changed in ways that may help explain what is going on. As documented by a large number of studies, such as Clarida, Galí, and Gertler (2000), the Fed now reacts much more vigorously to changes in inflation than it did during the 1960s and 1970s. This has led to a marked decline in core inflation and inflation volatility since the 1970s. Various surveys reveal that the decline in inflation has been accompanied by a decline in inflation expectations; further, it is generally agreed that inflation expectations are much better contained than they were in the 1970s. Fed credibility appears to be tied to this change in expectations.

Changing inflation expectations are likely to be part of the reason why recent oil shocks have not had the same impact on inflation that they did in the 1970s and could also explain Hooker's findings on the change in the Fed's response to oil shocks. It appears that during the 1970s households and firms did not expect the Fed to act to offset the inflationary impulse created by a jump in the price of oil, and this led to a jump in expected inflation. By contrast, more recently, the Fed is expected to act to counter the effect of higher oil prices and expected inflation does not react very much. Because of the smaller response of expected inflation, the Fed need not respond as vigorously to an oil shock as it did in the 1970s.

### **What happened in the 1970s?**

Changing inflation expectations do not appear to be the entire story, though, as the estimated effect of an increase in the price of oil on inflation during the 1970s still appears implausibly large. Hooker, for instance, finds that a 1% increase in the relative price of oil caused an increase of

nearly 3% in the core PCEPI over two years (during the 1962–1980 period). These results are hard to explain, given the relative size of the energy sector. For instance, consumer expenditures on energy have never amounted to 10% of total consumption expenditures over our sample. Using a formal model, Guerrieri (2005) obtains results that are consistent with this intuition; in a situation where the monetary authority cares about both output and inflation, a 50% increase in the price of oil lowers the level of output by 0.4% after two years and raises the core PCEPI by 0.2 percentage point. These estimates suggest that the inflationary impulse from the oil shocks was not that large. The puzzle then is why economic agents would expect a disproportionate increase in inflation—even if they believed that the Fed would not act to offset this inflationary impulse.

A comparison of the changes in the relationship between oil prices and inflation to changes in the relationship between commodity prices and inflation suggests one possible explanation. Hooker's results for oil prices can be replicated in a small vector autoregression that contains measures of core inflation, unemployment, and oil prices. The results are the same if we substitute commodity prices (excluding oil) for oil prices. Specifically, commodity prices predict core PCEPI before 1981, but not after. Others, such as Furlong and Ingenito (1996), have noted this change in the predictive power of commodity prices, as well.

It is well known that commodity prices are sensitive to inflation expectations. Volatile inflation expectations may well have dominated the behavior of commodity prices during the 1970s, which may explain their ability to predict inflation during that period. The volatile expectations themselves reflected the conduct of monetary policy. For instance, some have suggested policymakers may have believed they could get permanently higher output in exchange for higher inflation, so they overstimulated the economy. As noted above, policy has become more focused on inflation since then, and inflation expectations have become better contained. As a consequence, commodity prices are now more likely to reflect developments specific to the commodity sector itself, and these developments may not provide that much information about core inflation (or at least no more than would be suggested by calculations based on a comparison of the cost of commodities relative to the price of other inputs, for instance).

A similar argument may appear harder to make for oil prices, since their behavior is subject to the OPEC cartel. However, one could get the same responses, to the extent that the cartel or other actors in the market are sensitive to economic developments such as changes in the value of the dollar, and the dollar itself reacts to U.S. monetary policy and expected inflation.

#### What the markets think

This *Letter* has argued that oil shocks are sometimes assigned too large a role in the run-up in inflation during the 1970s because analysts tend to ignore the part played by inflation expectations and by monetary policy during this period. The implication is that the recent oil shock should not lead to as much inflation as the 1970s would suggest. Financial markets provide confirming evidence.

For instance, the price of West Texas Intermediate crude oil has risen by nearly 50% from the beginning of the year to October 17 (the time of this writing). Over this period, the yield on 10-year Treasuries has risen by 26 basis points. The inflation-adjusted rate, as measured by the rate on 10-year Treasury Inflation Protected Securities has risen by 26 basis points as well. Thus, the inflation-compensation component of the yield is unchanged. The 5-year Treasury yield tells a similar story: the nominal rate has risen 73 basis points over this period, while the real rate has risen 69 basis points. Thus, the inflation-compensation component is up slightly. Of course, interest rate movements over this period reflect the many other developments that have also taken place. Even so, it seems safe to say that there is little evidence to suggest that markets are expecting substantially higher inflation as a result of the run-up in oil prices since the beginning of the year.

As discussed earlier, this could be because the markets are expecting the Fed to respond vigorously

to the run-up in oil prices. But a look at the fed funds futures markets reveals that markets are not expecting very large policy moves. At the time of this writing, when the fed funds rate is at 3.75%, futures for December are trading at 4.13% while those for March are trading at 4.41%.

Thus, financial market expectations do not appear to be out of line with the statistical analysis. Markets do not expect the recent substantial rise in oil prices to lead to a substantial increase in inflation, and they expect this result to occur without the kind of funds rate increases one saw in the 1970s. Of course, market forecasts could be wrong.

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