

# Chicago Fed Letter

## What are the implications of rising commodity prices for inflation and monetary policy?

by Charles L. Evans, president and chief executive officer, and Jonas D. M. Fisher, vice president and director of macroeconomic research

The recent run-ups in oil and other commodity prices and their implications for inflation and monetary policy have grabbed the attention of many commentators in the media. Clearly, higher prices of food and energy end up in the broadest measures of consumer price inflation, such as the Consumer Price Index. Since the mid-1980s, however, sharp increases and decreases in commodity prices have had little, if any, impact on core inflation, the measure that excludes food and energy prices.

We study the influence of a credible inflation-fighting central bank by comparing responses of core inflation and the monetary policy instrument in the pre- and post-Volcker periods.

**Some** economists argue that rising commodity prices are inflationary and, therefore, require a tightening of monetary policy.<sup>1</sup> Others say rising commodity prices have sometimes led to inflation and sometimes not. Therefore, a monetary policy response may not be required.<sup>2</sup> In this *Chicago Fed Letter*,<sup>3</sup> we empirically assess these views by conducting a statistical analysis of quarterly data on commodity prices, inflation, and monetary policy since 1959. We find that since the mid-1980s, after the big oil shocks and the tenure of Paul Volcker as chairman of the Federal Open Market Committee (FOMC), the reactions of both core inflation and the federal funds rate (the monetary policy instrument) to shocks in oil and other commodity prices have been extremely modest. We use our estimates to assess the current stance of monetary policy.

### Methodology

To assess inflationary pressures in the economy, we can look at many potential indicators of future inflation, such as rising commodity prices. But how do we determine the relative importance of these indicators? One objective approach is to include an indicator in an inflation-forecasting relationship and

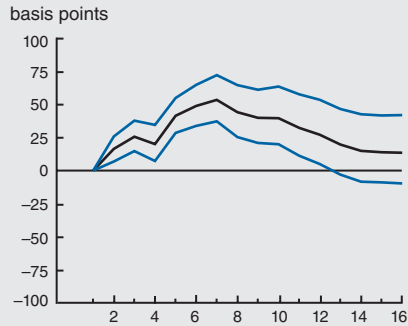
examine its contribution to improving forecasting performance. Using this approach, we find evidence from some single equation models that we track at the Chicago Fed that suggests commodity prices are poor predictors of changes in future core inflation. However, this might be because, as a credible inflation-fighting central bank, the Federal Reserve has historically tightened policy to eliminate the inflationary consequences of large changes in commodity prices. Accounting for such monetary policy reactions is an interesting and subtle issue, and there are several valid approaches. Here, we employ a reduced-form statistical framework.<sup>4</sup> To identify the influence of monetary policy, we estimate the typical response of core inflation and the monetary policy instrument following an unexpected change in commodity prices. We study the influence of a credible inflation-fighting central bank by comparing responses in the pre- and post-Volcker periods.

We consider three distinct hypotheses:

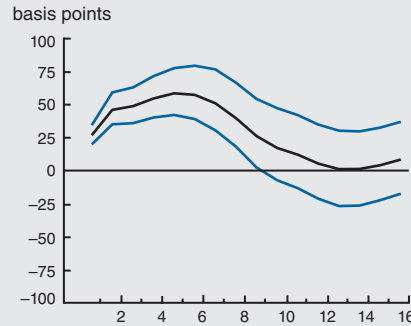
- *Weak central bank credibility hypothesis:* If commodity prices have a substantial effect on actual inflation and the policy response is inadequate, we should see an increase in inflation

## 1. Responses to CRB price shocks

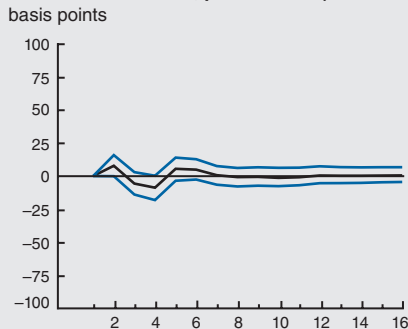
**A. Core PCE inflation, pre-Volcker**



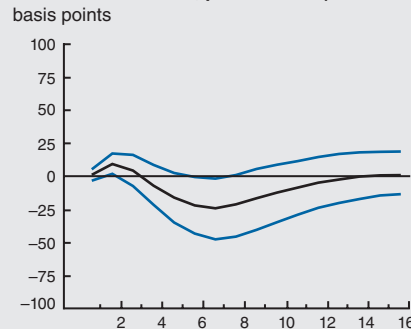
**B. Federal funds rate, pre-Volcker**



**C. Core PCE inflation, post-Volcker (to 2008:Q4)**



**D. Federal funds rate, post-Volcker (to 2008:Q4)**

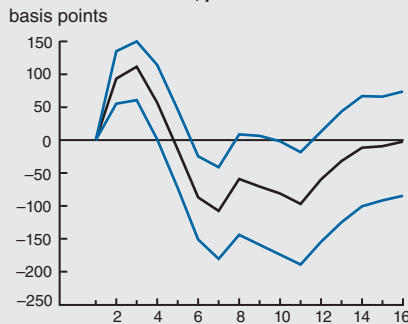


NOTES: The blue lines are 68% posterior probability bands. CRB indicates Commodity Research Bureau; PCE indicates personal consumption expenditures.

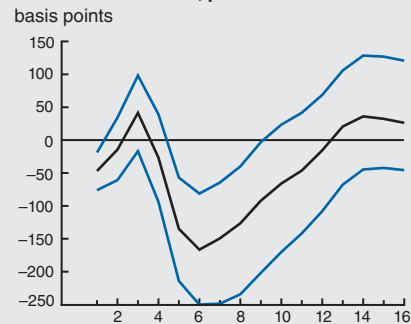
SOURCE: Authors' calculations based on data from Haver Analytics.

## 2. Responses to oil price shocks

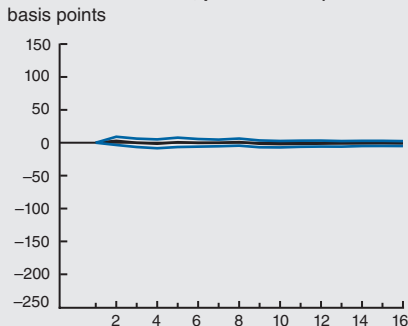
**A. Core PCE inflation, pre-Volcker**



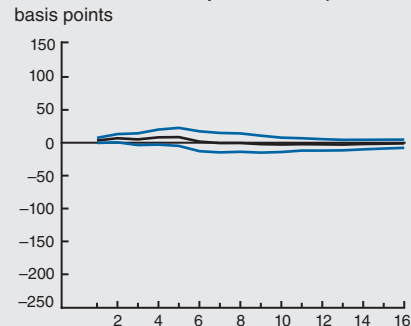
**B. Federal funds rate, pre-Volcker**



**C. Core PCE inflation, post-Volcker (to 2008:Q4)**



**D. Federal funds rate, post-Volcker (to 2008:Q4)**



NOTES: The blue lines are 68% posterior probability bands. CRB indicates Commodity Research Bureau; PCE indicates personal consumption expenditures.

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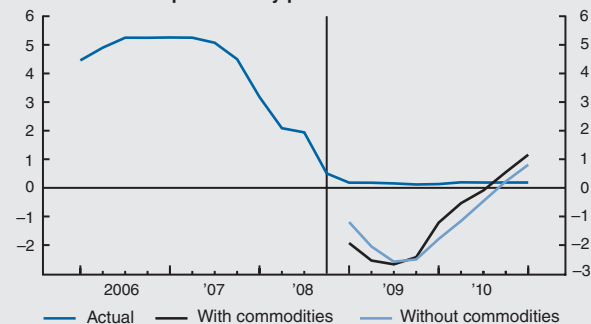
following a commodity price increase. Presumably, this evidence would be most apparent during the pre-Volcker period (1959–79).

- *Strong central bank credibility hypothesis:* If commodity prices have a substantial effect on inflation and the policy response is adequate, we should see no significant increase in inflation following a commodity price increase. However, we should see a response in the fed funds rate, reflecting the tightening of monetary policy. This might be apparent in the post-Volcker sample period (1982–2008).
- *A generally uninformative indicator hypothesis:* If commodity prices were truly uninformative for inflation, they would generate insignificant responses of both inflation and the policy instrument.

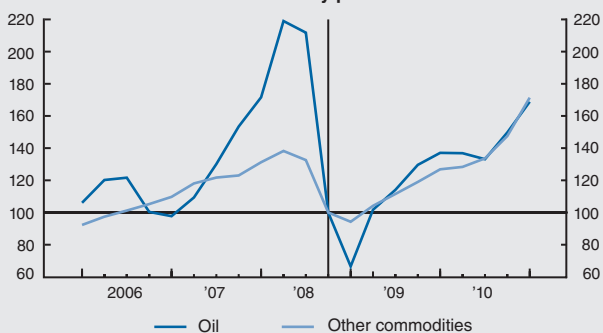
We estimate these hypotheses with the vector autoregressive (VAR) model that Bernanke, Gertler, and Watson used to study monetary policy and the effect of oil price shocks.<sup>5</sup> We use quarterly data for core PCE inflation (personal consumption expenditures without food and energy), growth in real gross domestic product (GDP), growth of the Commodity Research Bureau's (CRB) Commodity Price Index (which consists of commodities other than oil), growth of the Producer Price Index (PPI) for crude petroleum, and the federal funds rate (FFR).<sup>6</sup> Following the literature, we assume the Fed (via the FFR) is able to respond contemporaneously to all the other variables in the model, but the other variables are affected by the funds rate only with a lag of one quarter. Inflation is assumed to depend on lags only. Under these assumptions, we examine how unanticipated changes in commodity prices influence inflation and monetary policy. We identify two commodity price shocks. The CRB shock is identified with the residuals from a regression of growth in the CRB price on four lags of itself and all the other variables in the system, plus current values of core inflation and GDP. The oil price shock is identified by a regression with the same conditioning variables, plus current CRB price growth. While we focus

### 3. Recent monetary policy and commodity prices

**A. Actual FFR and predicted by post-Volcker rules**



**B. Recent oil and non-oil commodity prices**



NOTE: FFR indicates federal funds rate.

SOURCE: Authors' calculations based on data from Haver Analytics.

on a limited set of results, our findings appear to be quite robust.<sup>7</sup>

#### Findings

The median dynamic responses of inflation and FFR to these identified shocks are displayed in figures 1 and 2 for the CRB shock and oil shock, respectively. These plots display the predicted quarterly time paths of inflation and the FFR following an unanticipated increase in CRB prices of 3% and oil prices of 10%, implied by our estimated VAR and identification scheme.<sup>8</sup> The blue lines represent 68% posterior probability bands, a measure of our uncertainty in the estimated paths. Panels A and B of the figures show estimates based on the pre-Volcker sample, 1959:Q1 to 1979:Q2, and panels C and D show estimates based on the post-Volcker sample, 1982:Q3 to 2008:Q4.

In the pre-Volcker period, core inflation rises significantly following an unanticipated increase in CRB commodity prices (figure 1, panel A). This occurs despite a significant reaction of the FFR to the same CRB shock (panel B). In the

post-Volcker period, the same size CRB shock leads to virtually no change in inflation (panel C). Whatever is driving the non-response of inflation in the post-Volcker period, it does not appear to be an aggressive response of monetary policy—the FFR response (panel D) is a small fraction of the reaction in the earlier period.

In figure 2, the responses to the oil shock follow a broadly similar pattern. In the pre-Volcker sample, core inflation and the FFR respond by a relatively large amount to the oil shock, although the statistical significance of the

FFR response is marginal. In the post-Volcker period, the core inflation response is virtually zero. Some case may be made here that the non-response of inflation is in part due to monetary policy reacting to the oil shock (figure 2, panel D). However, we discount this interpretation because the magnitude of the response is tiny—a surprise increase in oil prices of 10% at best merits a rise in the FFR of only 10 basis points.

In sum, figures 1 and 2 provide some evidence for the “weak central bank credibility” hypothesis during the pre-Volcker period. In the post-Volcker era, neither core inflation nor monetary policy has been very sensitive to surprises in commodity prices, consistent with the “uninformative indicator” hypothesis.

Finally, we quantify the effects that recent oil and CRB shocks should have on policy according to the estimated policy rules. The fact that we’ve been constrained by the zero lower bound (i.e., FFR close to zero) makes this exercise problematic. The estimated rules clearly do not hold in a period

when the bound comes into play. However, to get at least a rough idea of the importance of commodity prices for monetary policy in the current period, we conducted a dynamic simulation of the post-Volcker rule, ignoring the existence of the zero lower bound.<sup>9</sup>

Figure 3 shows the actual path of the FFR since 2005:Q1 (blue line), along with the values predicted by our estimated post-Volcker monetary policy rule for 2009:Q1 forward (black line) and a version of this policy rule that excludes commodity prices (light blue line). The predicted values for FFR are from simulations in which variables other than FFR are set at their realized values, but FFR is determined dynamically.<sup>10</sup> The last data point is for 2011:Q1, and was fitted based on our own estimates for GDP and core PCE inflation and the commodity and oil prices in that quarter.<sup>11</sup>

If we focus on the policy rule that includes commodity prices, after 2008:Q4 the fitted funds rate quickly goes negative, reaching as low as  $-2.66\%$  in 2009, whereas actual policy is constrained by the zero lower bound. The predicted policy rate gradually rises as data on

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GDP growth improved in late 2009 and 2010, reaching 1.15% for the current quarter. It is important to note that the policy rule depends on growth rates and contains no GDP or inflation gap variables. In this respect it is not a traditional Taylor rule.

The most important point to take away from figure 3 is that the difference between the policy rules with and without commodity prices is quite small, averaging only 40 basis points over the period. Even with the very large run-up

in oil and CRB shown in the bottom panel of figure 3, estimated policy rules from the post-Volcker period do not suggest a large response of policy.

### Conclusion

The modest dependence of policy on energy and other commodity prices implied by our analysis is not surprising. The shares of firm costs accounted for by energy and commodities are not large and, in fact, have fallen over time. Moreover, at least in the case of oil,

price increases tend to slow the economy even without any policy rate increases. Of course, if commodity and energy prices were to lead to a general expectation of a broader increase in inflation, more substantial policy rate increases would be justified. But assuming there is a generally high degree of central-bank credibility, there is no reason for such expectations to develop—in fact, in the post-Volcker period, there have been no signs that they typically do.

<sup>1</sup> See Allan H. Meltzer, 2011, “Ben Bernanke’s ‘70s show,” *Wall Street Journal*, February 5, available at <http://online.wsj.com/article/SB10001424052748704709304576124033729197172.html>.

<sup>2</sup> For an elaboration of this view, see Laurence H. Meyer, 2011, “Inflated worries,” *New York Times*, March 24, available at [www.nytimes.com/2011/03/25/opinion/25meyer.html?\\_r=2&ref=opinion](http://www.nytimes.com/2011/03/25/opinion/25meyer.html?_r=2&ref=opinion).

<sup>3</sup> We thank Helen Koshy, Spencer Krane, David Marshall, and Daniel Sullivan for improving this article.

<sup>4</sup> One could also formulate a structural economic model. See Lawrence J. Christiano, Martin Eichenbaum, and Charles L. Evans, 2005, “Nominal rigidities and the dynamic effects of a shock to monetary policy,” *Journal of Political Economy*, Vol. 113, No. 1, February, pp. 1–45; and Alejandro Justiniano, Giorgio Primiceri, and Andrea Tambalotti, 2011, “Investment shocks and the relative price of investment,” *Review of Economic*

*Dynamics*, Vol. 14, No. 1, January, pp. 101–121, for some of the challenges involved in proceeding with a structural model.

<sup>5</sup> Ben S. Bernanke, Mark Gertler, Mark Watson, Christopher A. Sims, and Benjamin M. Friedman, 1997, “Systematic monetary policy and the effects of oil price shocks,” *Brookings Papers on Economic Activity*, Vol. 1997, No. 1, pp. 91–157.

<sup>6</sup> The CRB Commodity Price Index and the federal funds rate are quarterly averages of monthly data. The PPI for crude petroleum is the quarterly average of monthly data. Core PCE inflation is measured as 400 times the log differences in the series levels. Growth rates are calculated as log first differences.

<sup>7</sup> The results are robust to including various financial spreads and unemployment, including from two to eight lags, using levels or growth rates of the variables, and the ordering of the two commodity price series in the VAR.

<sup>8</sup> These shocks are roughly one standard deviation for the CRB shock in both samples and in the post-Volcker period for the oil shock. The standard deviation of the oil shock is about five times smaller in the pre-Volcker period, primarily because there is virtually no growth in the oil price over the first half of this sample.

<sup>9</sup> In a figure available on our website, we show that the fitted values of the estimated policy rules with and without commodity prices track actual monetary policy very closely. The figure is located on the Other Resources page at [www.chicagofed.org/webpages/people/fisher\\_jonas\\_d\\_m.cfm](http://www.chicagofed.org/webpages/people/fisher_jonas_d_m.cfm).

<sup>10</sup> That is, from 2009:Q2 forward, the lagged predicted values of FFR are used to calculate the current-period fitted FFR.

<sup>11</sup> We assume annualized GDP growth, annualized core inflation, quarterly growth in CRB, and quarterly growth in oil prices of 3.3%, 1%, 16.2%, and 12.8%, respectively, during 2011:Q1.