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Understanding the Price Puzzle

Few economists expected the bond market's negative reaction to the Federal Reserve's initial move to raise the federal funds rate during early 1994. To alleviate potential inflationary pressures, on February 4, 1994, the Federal Reserve increased the federal funds rate by 25 basis points to 3.25 percent. In response, long-term bond yields promptly increased 50 basis points over the following four weeks. At the time, bond market participants attributed much of the run-up in yields to worries that inflation would increase during the next year, thus eroding the value of fixed-income securities.

While many economists were caught off guard by the bond market's reaction, historical data on the federal funds rate and subsequent inflation behavior perhaps explain the reaction. Historical data show a positive relationship between inflation and the federal funds rate, the rate over which the Federal Reserve has the most control.[1] Thus, one explanation for the bond market's behavior is that increases in the federal funds rate have historically been associated with subsequent increases in inflation. If history is any guide, bond market participants were right to be worried.

The positive relationship between the federal funds rate and inflation has become known as the "price puzzle" (Bernanke and Blinder 1992; Christiano, Eichenbaum, and Evans 1994, forthcoming; and Sims 1992). It is a puzzle because an unexpected tightening of monetary policy (that is, an unexpected increase in the federal funds rate) is expected to be followed by a decrease in the price level, rather than an increase.

In this article, we document the positive correlation between federal funds rate increases and subsequent increases in prices. The strength of this correlation does not appear to be uniform over the postwar period. In previous work (Balke and Emery 1994), we found that relationships that had held in the 1960s and 1970s broke down in the 1980s. As a result, we also evaluate whether the price puzzle is present to the same degree in all periods. We find that evidence of the price puzzle is substantially stronger during the 1960s and 1970s than during the 1980s. In the 1980s, the correlation between the federal funds rate and future inflation is close to zero but is still not negative, as traditional theory would predict.

We also evaluate possible explanations for the price puzzle. These involve the Federal Reserve systematically responding to signals of higher future inflation by raising the federal funds rate, but not by enough to fully offset the subsequent inflation. Indeed, a plausible explanation appears to be that, during the 1960s and 1970s, the Federal Reserve responded to supply shocks by raising the federal funds rate but not by enough to prevent the aggregate price level from changing. Thus, a positive correlation between the federal funds rate and inflation arises. Since the early 1980s, however, the price puzzle has moderated. We suggest two possible reasons: the Federal Reserve has put more emphasis on achieving price stability and, hence, has responded more

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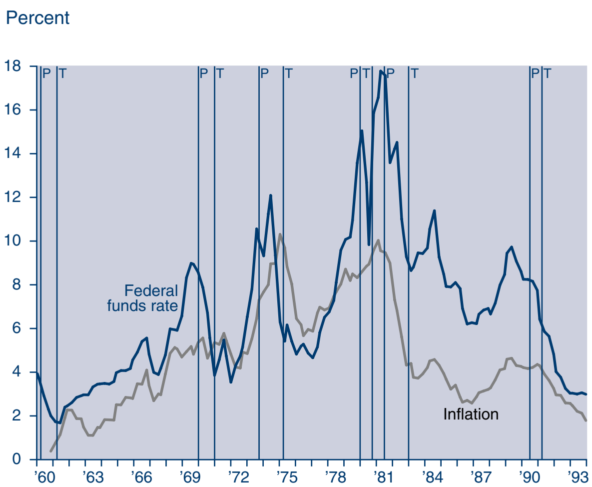
[1] *The Federal Reserve influences this rate by buying or selling U.S. Treasury securities to the private sector, thus controlling the amount of reserves in the banking system. The federal funds rate is simply the market interest rate that banks must pay to borrow reserves overnight.*

Figure 1
Federal Funds Rate and Inflation



SOURCE: Board of Governors, Federal Reserve System.

vigorously to inflationary shocks, or there simply have been fewer large inflationary shocks to the economy.

This article is organized as follows. In the first section, we document the positive correlation between federal funds rate changes and subsequent inflation. In the second section, we present possible explanations for the price puzzle. Both explanations involve the Federal Reserve's systematic response to inflationary shocks. The third section examines whether these explanations are capable of explaining the price puzzle. Finally, in the fourth section, we conclude by interpreting the empirical results.

Documenting the price puzzle

The price puzzle arises because increases in the federal funds rate tend to be followed by increases in inflation. In this section, we document the existence of this positive correlation.

As shown in Figure 1, the federal funds rate and year-over-year inflation, as measured by the gross domestic product deflator, appear to be positively related: periods of high inflation coincide with relatively high federal funds rates. Note that during the 1960s and 1970s, both inflation and the federal funds rate have trended upward, whereas since 1982, the trend in inflation has been flat, while the federal funds rate has trended downward.

More formal evidence of the price puzzle is given in Table 1. Table 1 presents results from simple regressions of the federal funds rate against the average annualized rate of inflation over two subsequent years for the sample 1960:1 through 1993:4. Whether or not a time trend is included in the regressions, the results confirm a positive relationship between the federal funds rate and future inflation. For the full sample and the 1960–79 subsample, the federal funds rate is highly significant. Interestingly, for the 1982:4–93:4 sample, the federal funds rate does not contain statistically significant explanatory power for subsequent inflation as reflected in an insignificant t-statistic on the federal funds rate and a negative adjusted-R^2 for the regression.[2] This suggests that the price puzzle may not be as evident in the post-1982 period.

The federal funds rate, monetary policy, and the price puzzle

Historically, changes in the quantity of money have often served as a measure of monetary policy. The main problem with money, however, is that it often changes for reasons that have nothing to do with monetary policy. For example, most measures of money are influenced by the behavior of both banks and individuals, which, in turn, are influenced by economic conditions. In other words, the observed data on money represent a confluence of both supply factors (monetary policy actions) and demand factors (such as private-sector portfolio shifts). The problem with using money as a measure for the stance of monetary policy is that it does not reflect mainly Federal Reserve actions.

Recently, several economists have argued that movements in the federal funds rate may be a better indicator of changes in monetary policy than are changes in the quantity of money (McCallum 1983, Laurent 1988, Bernanke and Blinder 1992,

[2] *Throughout the paper, we do not separately examine the 1979:4 through 1982:3 sample because during this period, in contrast to the rest of the sample, the Federal Reserve did not target the federal funds rate in its implementation of monetary policy.*

Table 1
Federal Funds Rate Regressed on Subsequent Inflation[1]

Sample	Trend not included: Coefficient on federal funds rate	Trend not included: adj. R^2	Trend included: Coefficient on federal funds rate	Trend included: adj. R^2
1960:1–93:4	.26 (2.11)*	.15	.30 (2.38)*	.15
1960:1–79:3	.75 (4.91)*	.56	.17 (2.72)*	.92
1982:4–93:4	.09 (.59)	.01	.05 (.43)	0

[1] Subsequent inflation equals the average annualized rate of inflation over the subsequent eight quarters as measured by the gross domestic product deflator.

T-statistics are in parentheses. To correct for possible heteroscedasticity as well as serial correlation, the White consistent covariance matrix with a Newey–West serial correlation correction and with a window width of twelve lags was estimated.

* Significant at the 5-percent level.

Quarterly data.

SOURCE: Board of Governors, Federal Reserve System.

and Goodfriend 1992). This view is based on the observation that, with the exception of the 1979–82 period, the Federal Reserve has implemented monetary policy by targeting the federal funds rate over short periods of time.

There is a potential shortcoming in directly using the federal funds rate as a measure of the stance of monetary policy. Movements in the rate reflect both the Federal Reserve's response to economic developments, as well as Federal Reserve actions that are independent, or exogenous, of these developments.[3] To assess the impact of exogenous monetary policy actions on the economy, several studies have used empirical models called *vector autoregressions* (VARs). (See the box entitled "Vector Autoregressions.") Basically, these models attempt to isolate the movements in the federal funds rate that are uncorrelated with changes in the other variables in the model and, thereby, represent purely exogenous movements in the federal funds rate, or exogenous monetary policy actions.

Using the VAR methodology, Bernanke and Blinder (1992), Sims (1992), and Christiano, Eichenbaum, and Evans (1994, forthcoming) have found that movements in the federal funds rate are largely consistent with the view that the funds rate is a good proxy for the stance of monetary policy. In this work, the Federal Reserve tightens policy in response to unexpected increases in both inflation and output. Additionally, unexpected, or exogenous, monetary policy actions are shown to have modest effects on real output. However, even in these VARs the price puzzle remains: exogenous monetary policy tightenings are followed by increases in the price level.

Consider a five-variable VAR similar to that examined by Christiano, Eichenbaum, and Evans (1994). This VAR includes real GDP (Y), the GDP deflator (P), the federal funds rate, nonborrowed reserves, and total reserves.[4] Figure 2 displays the response of output and prices to a so-called ex-

[3] *The rule that relates policy actions to developments in the economy is often referred to as the* feedback rule.

[4] *With the exception of the federal funds rate, all variables are in logarithms.*

Figure 2
Impulse Response of *Y* and *P*
To Federal Funds Rate Innovation, 1960–93

Log level

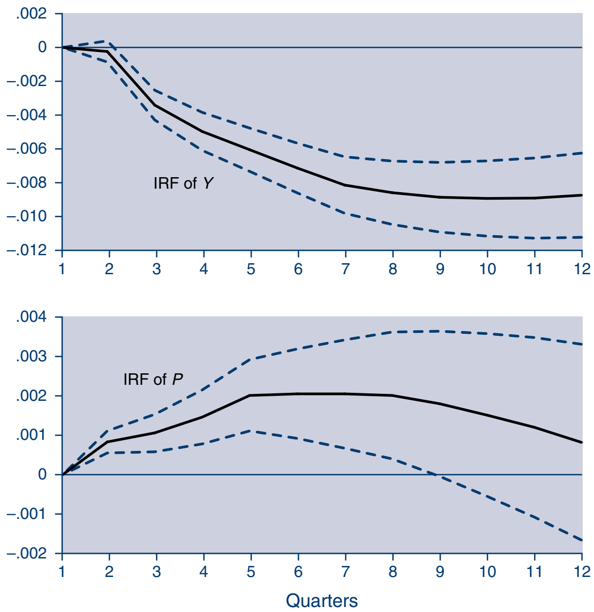
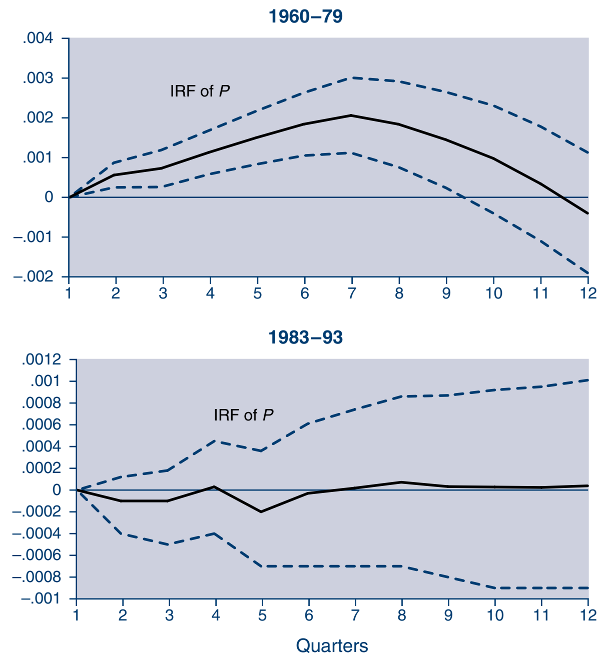


Figure 3
Impulse Response of *P*
To Federal Funds Rate Innovation

Log level



ogenous increase in the federal funds based on the entire 1960–93 sample.[5] While output falls in response to a monetary contraction, prices rise. Thus, the price puzzle is present.

When the full sample is broken into subsamples, the VAR evidence of a price puzzle becomes mixed.[6] Figure 3 plots the response of prices to a federal funds shock in the 1960–79 period and the post-1982 period. As shown in the figure, the price puzzle is present in the 1960–79 period; an exogenous increase in the federal funds rate results in a substantial increase in the price level. By contrast, the price puzzle is not as evident in the post-1982 period. During this period, a federal funds rate innovation does not cause prices to systematically rise; the effect on prices, though negative, is small and not statistically different from zero.

An alternative to the VAR approach

Rather than using the federal funds rates as an indicator of monetary policy or trying to identify monetary interventions econometrically, Romer and Romer (1989) examine the historical record to determine dates when a contractionary monetary policy action was taken.[7] To evaluate whether the price puzzle still exists using the Romer–Romer dates as proxies for monetary contractions, we run a regression of inflation (or prices) against four lags of inflation and the current value and eight

[5] *The federal funds rate comes third, after output and prices, in the causal ordering implied by the Choleski decomposition. The dotted lines in Figures 3 through 12 are one-standard error confidence bands.*

[6] *We tested whether a VAR estimated over 1960:1–79:3 was the same as a VAR estimated over 1982:4–93:4 (see Doan 1992) and could reject the null hypothesis of equality. This result was robust to whether the VAR was estimated in levels or first differences.*

[7] *The Romer–Romer dates are: 1968:4, 1974:2, 1978:3, 1979:4. The date 1988:3 is also included as a monetary contraction, based on work by Oliner and Rudebusch (1992).*

Vector Autoregressions

Vector autoregressions (VARs) are time series models that use only past values of the variables of interest to make forecasts. For instance, a three-variable VAR system of output, prices, and the federal funds rate can be expressed as

$$Y_t = \beta_1 + \beta_2 \Sigma\, Y_{t-i} + \beta_3 \Sigma\, P_{t-i} + \beta_4 \Sigma\, f_{t-i} + \epsilon_{\beta t}$$
$$P_t = \gamma_1 + \gamma_2 \Sigma\, Y_{t-i} + \gamma_3 \Sigma\, P_{t-i} + \gamma_4 \Sigma\, f_{t-i} + \epsilon_{\gamma t}$$
$$f_t = \delta_1 + \delta_2 \Sigma\, Y_{t-i} + \delta_3 \Sigma\, P_{t-i} + \delta_4 \Sigma\, f_{t-i} + \epsilon_{\delta t},$$

where Y, P, and f are output, the price level, and the federal funds rate, respectively. β is an intercept term, t is a time subscript, Σ is the summation sign, and ϵ is an error term. Thus, each of the three variables is expressed as a linear function of past values of itself and past values of other variables in the system.

In practice, the estimated error terms from each equation are correlated so that it is incorrect to assume that, for instance, ϵ_{ft} represents an independent surprise movement in the federal funds rate. To better interpret the dynamic relationships present in the data, the residuals from the VAR are broken up into linear combinations of independent (orthogonal) shocks. A common orthogonalization is to assume that the VAR system is *recursive* so that there is a chain of causality among surprises in the variables during any given period. For example, a possible recursive system of the VAR above is one in which output responds to an exogenous shock, the price level responds to the contemporaneous output shock and an exogenous price shock, while the federal funds rate responds to output and price level shocks contemporaneously as well as to an exogenous federal funds rate shock. In effect, a new set of surprises, or shock terms for each variable, are created that are now uncorrelated with each other. The transformation of the original shocks into recursive, orthogonal shocks is called the *Choleski decomposition*.

The Choleski decomposition is controversial because if the VAR is used to draw economic inferences, then the recursive restriction imposed on the system should be supported by economic theory. If the identifying assumption of recursivity is not justified, then the estimated parameters will be a mixture of both structural and reduced-form parameters.

For more on VARs, see Todd (1990), Runkle (1987), Sims (1986), Cooley and LeRoy (1985), and Hakkio and Morris (1984).

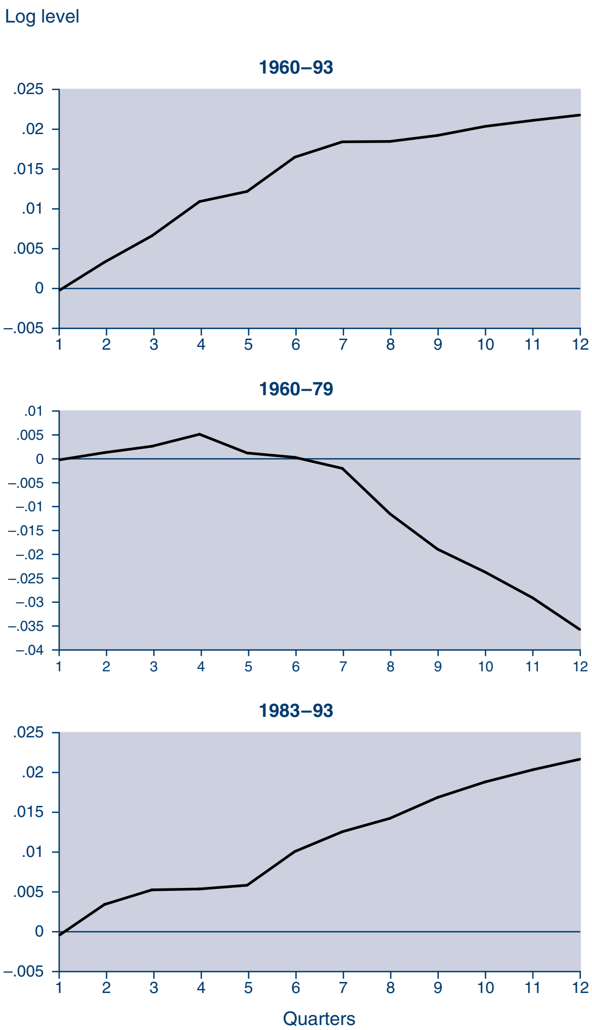
lags of a dummy variable that takes the value of 1 during a Romer–Romer monetary contraction date and zero otherwise. Figure 4 plots the dynamic response of the price level in response to the Romer–Romer dummy. For the full sample and the post-1982 sample, we see evidence of the price puzzle; prices tend to rise following a Romer–Romer monetary contraction. For the 1960–79 sample, the response of prices is initially flat and then falls six quarters after a Romer–Romer contraction. This suggests that the Romer dates may be a better proxy for monetary contractions in the early part of the sample than in the later part.

Overall, there appears to be a positive correlation between federal funds rate increases and future inflation. However, the extent of this correlation is sensitive to sample periods examined. With the exception of the Romer–Romer dates, the price puzzle is much more evident in the pre-1980 sample than in the post-1982 sample. This result holds for sophisticated VAR or intervention analysis as well as for simple regressions. In the next section, we explore some explanations for the positive correlation.

Explanations of the price puzzle

One explanation of the price puzzle suggested by Sims (1992) is that the Federal Reserve systematically responds to expectations of higher future inflation by raising the federal funds rate but by not enough to prevent inflation from actually rising. The result is that increases in the federal funds rate are followed by increases in inflation. The Sims explanation thus involves a forward-looking Federal Reserve that, nonetheless, fails to effectively prevent the anticipated future inflation. It also implies that the positive correlation between an apparently contractionary monetary policy intervention and future prices stems, in part, from failing to properly identify exogenous changes in the federal funds rates. Sims suggests that the Federal Reserve has information about future inflation that is not present in the simple VARs

Figure 4
Impulse Response Functions
Of *P* to Romer–Romer Dates



described in the previous section, and as a result, innovations in the federal funds rate from these VARs partly reflect the systematic response to inflationary shocks and are not truly exogenous.

An alternative, but similar, explanation is that the Federal Reserve reacts to supply shocks by raising the federal funds rate. A temporary, negative supply shock, for example, would have the effect of raising real interest rates, decreasing output, and increasing prices (at least in the short run). The Federal Reserve responds to the supply shock by raising the federal funds rate but by not enough to extinguish the inflationary consequences of the supply shock. Note that the supply shock explanation can explain both the price puzzle and the negative response of output to a positive federal funds rate innovation, even if monetary policy has no effect on the real economy. Furthermore, the degree to which the monetary authority is willing to "extinguish" the price increase might depend on the weight it places on price stability in its objective function relative to output stabilization; the greater the weight on price stability, the more aggressively the monetary authority reacts to the supply shock and, hence, the smaller the price puzzle.

Interestingly, for both explanations, the fact that the price puzzle appears muted in the 1980s suggests that the Federal Reserve's reaction function may have changed. The Federal Reserve may have become more forward looking in its inflation fighting effort (trying to stay ahead of the curve) and has more effectively preempted inflationary pressures. Alternatively, it may have placed more weight on price stability when reacting to supply shocks.[8]

Is the price puzzle solved?

These explanations for the price puzzle revolve around the Fed's response to inflationary pressures. Thus, to effectively evaluate these explanations within a VAR framework, one must introduce a variable into the system that contains information about future inflation or supply shocks that is not already contained in the existing VAR. Furthermore, evaluating these explanations involves examining the Fed's reaction function; namely, how does the federal funds rate respond to possible inflationary shocks? Much of the previous literature has failed to note the Fed's reaction function.

Christiano, Eichenbaum, and Evans (1994, forthcoming) have argued that the price puzzle is

[8] *Possibly, though, supply shocks may have been relatively small or positive since 1982 so that the Fed could focus more on its price stability objective. This explanation implies an asymmetric objective function in which the Fed is less willing to extinguish the inflationary consequences of negative supply shocks (and suffer the negative output consequences) than positive supply shocks.*

Figure 5
Impulse Response of *Y* and *P*
To Federal Funds Rate Innovation, 1960–93
(Commodity Prices Included)

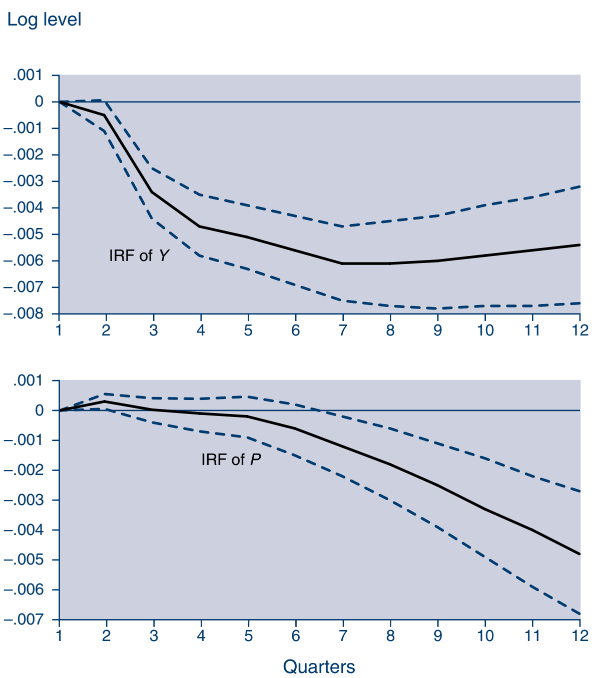
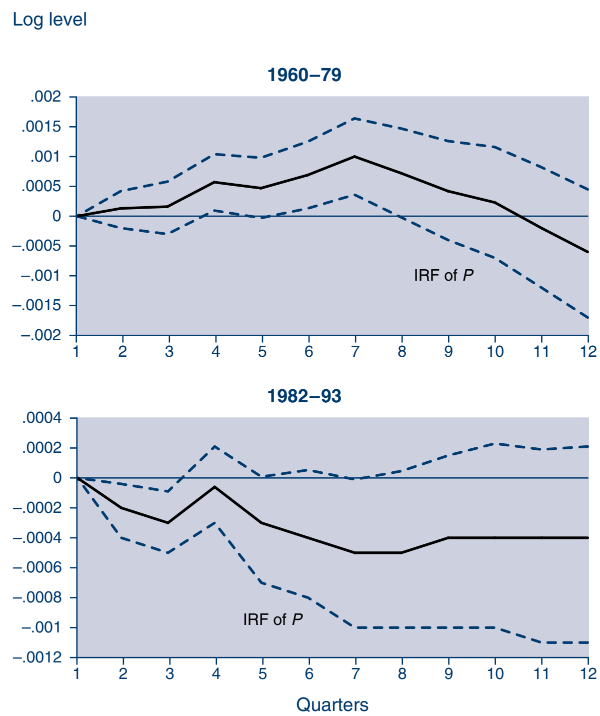


Figure 6
Impulse Response of *P*
To Federal Funds Rate Innovation
(Commodity Prices Included)



resolved when commodity prices are included in the basic VAR examined earlier. Commodity prices have been suggested to provide information about future inflation and could also be correlated with supply shocks. Thus, a priori, they are a good candidate for inclusion in the VAR. We replicate Christiano, Eichenbaum, and Evans' results when we include commodity prices in the basic vector autoregression.[9] Figure 5 plots the response of output and prices to a federal funds rate shock once commodity prices have been included in the VAR. As in Christiano, Eichenbaum, and Evans, a positive federal funds rate shock causes prices and output to fall. Furthermore, the reaction of the federal funds rate to a commodity price shock is consistent with the Sims and supply shock explanations of the price puzzle: a positive commodity price shock causes the federal funds rate to rise (not shown in figures). Indeed, the reaction of the federal funds rate to positive output and price shocks is consistent with a "lean against the wind" policy on the part of the Fed.

While including commodity prices in the VAR appears to solve the price puzzle for the full sample, when we examine the subsamples the evidence is less conclusive. Figure 6 presents the impulse response function of prices to a federal funds rate shock in the 1960–79 and 1982–93 subsamples.[10] While commodity prices succeed in eliminating the price puzzle in the latter period, they do not solve the price puzzle in the pre-1980 period. For the 1960–79 sample, prices are higher than their original level for nearly three years after a positive federal funds rate shock. Thus, even after includ-

[9] *In the vector autoregression, commodity prices come after output and aggregate prices but before the federal funds rate in the Choleski ordering.*

[10] *We tested whether the VAR parameter estimates were the same in the 1960–79 and post-1982 samples and could reject equality.*

Figure 7
Impulse Response Functions of *P*
To Federal Funds Rate
(Spread Included)

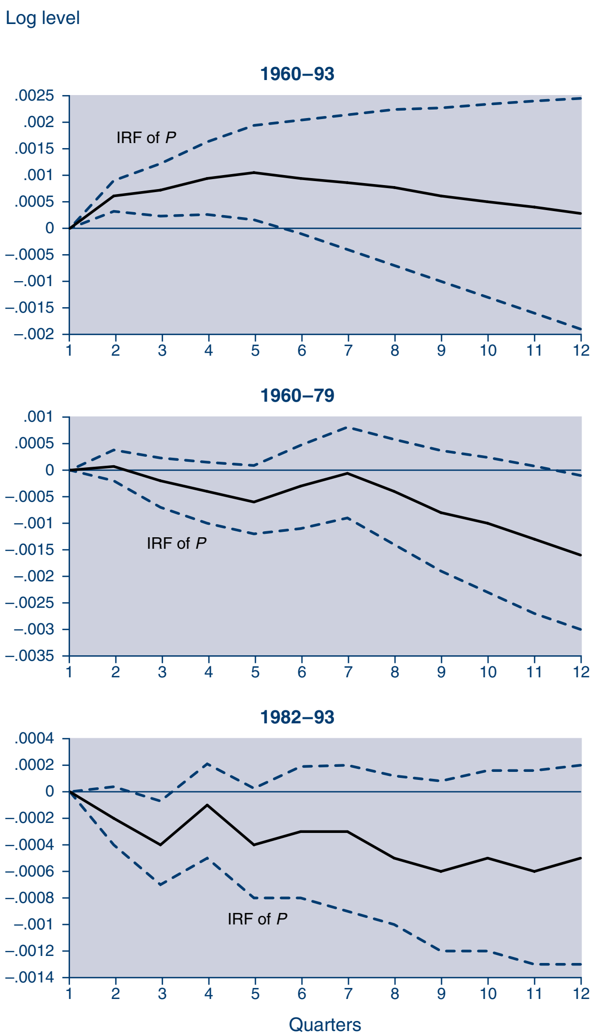
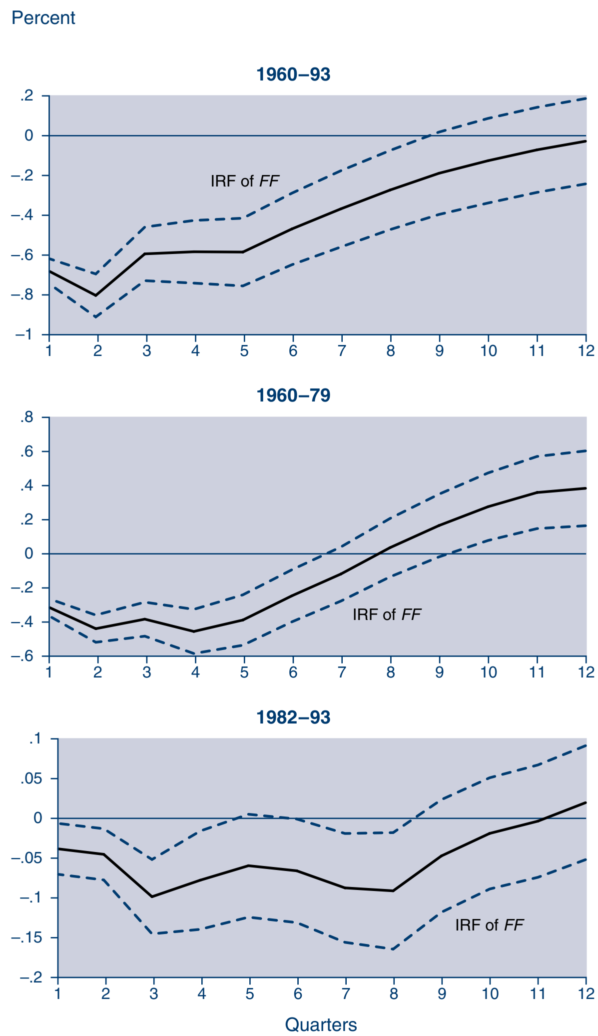


Figure 8
Impulse Response Functions
Of Federal Funds Rate (*FF*) to Spread
(Spread Included)



ing commodity prices in the VAR, the price puzzle is still unresolved for the 1960–79 period.

We examine whether other variables might be able to solve the price puzzle; these include the spread between long- and short-term interest rates, short- and long-term interest rates individually, oil prices, stock prices, unit labor costs, the index of leading economic indicators, and industrial capacity utilization.[11] Of these, only the spread between long- and short-term interest rates helps solve the price puzzle, but it does so only if the period 1979–82 is excluded.[12] Figure 7 shows the

[11] *These were done one variable at a time to keep the dimension of the VAR relatively low. For the impulse responses, each of these variables is placed third in the Choleski ordering, behind output and prices but before the federal funds rate.*

[12] *The spread variable is defined to be the ten-year Treasury bond rate minus the three-month Treasury bill rate.*

Figure 9
Impulse Response Functions
Of *Y* and *P* to Spread, 1960–93
(Spread Included)

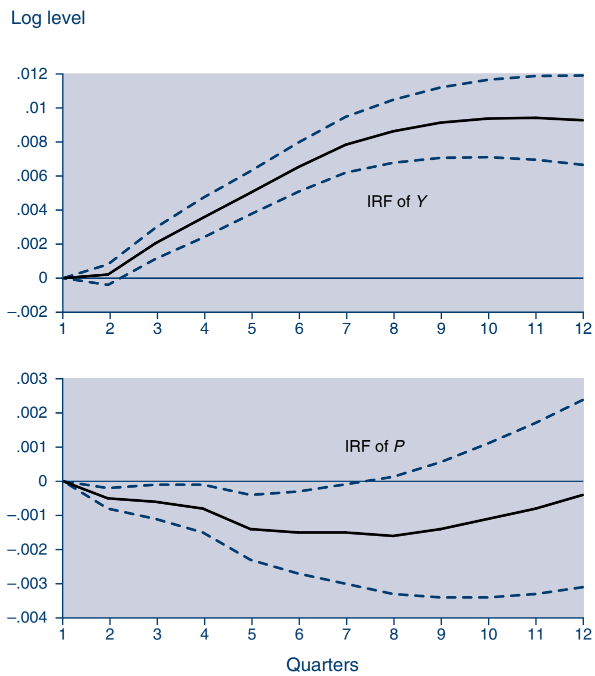
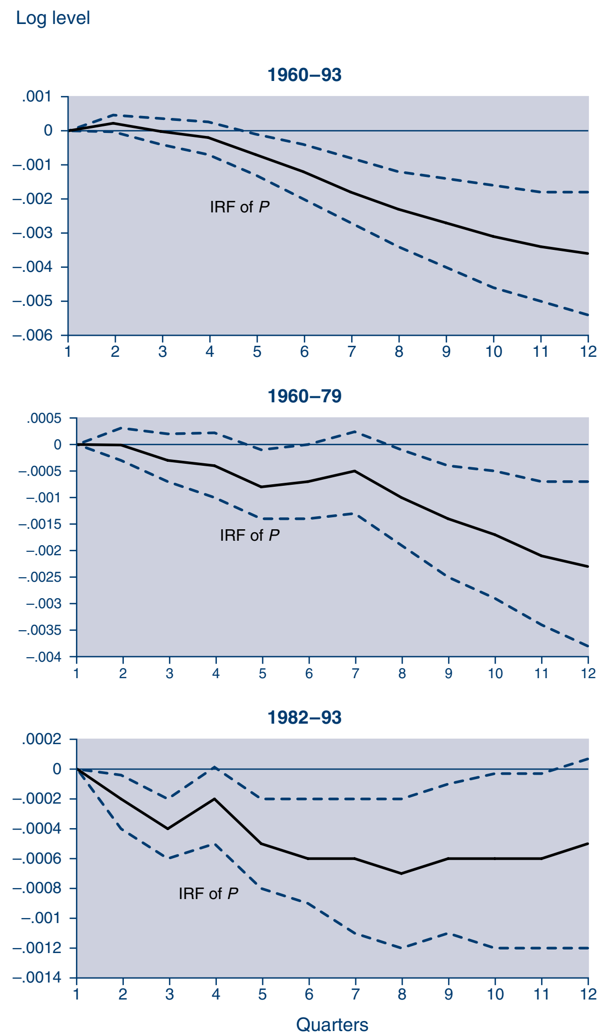


Figure 10
Impulse Response Functions of *P*
To Federal Funds Rate
(Commodity Prices and Spread Included)



response of prices to a federal funds shock for the full sample as well as the 1960–79 and post-1982 subsamples once the spread has been included in the VAR. In the full-sample VAR, including the spread does not solve the price puzzle; prices still rise in response to a positive federal funds shock. However, unlike commodity prices, including the spread eliminates the price puzzle during the 1960–79 period. The spread also eliminates the price puzzle in the post-1982 period. That the spread fails to work in the full sample may be the result of the extreme volatility exhibited by interest rates, including the federal funds rate, during the 1979–82 period.

Because the reaction function of the Fed is integral to explaining the price puzzle, we present the response of the federal funds rate to a shock in the interest rate spread (*Figure 8*). The impulse response functions suggest that the federal funds rate tends to move in the *opposite* direction of a spread shock; a positive spread shock (that is, long-term rates rising more than short-term rates) causes the federal funds rate to fall. The negative response of the federal funds rate to an increase in the spread does not entirely square with the pure inflation expectations explanation of the price puzzle. A rise in inflation expectations would more likely be reflected in an increase in the interest rate spread, as long-term rates respond more than short-term rates to expectations of future inflation. The negative response of the federal funds rate to the increase in the spread is not, therefore, consistent with the Fed tightening

Figure 11
Impulse Response Functions of Federal Funds Rate (Commodity Prices, *PSC*, and Spread, *SP*, Included)

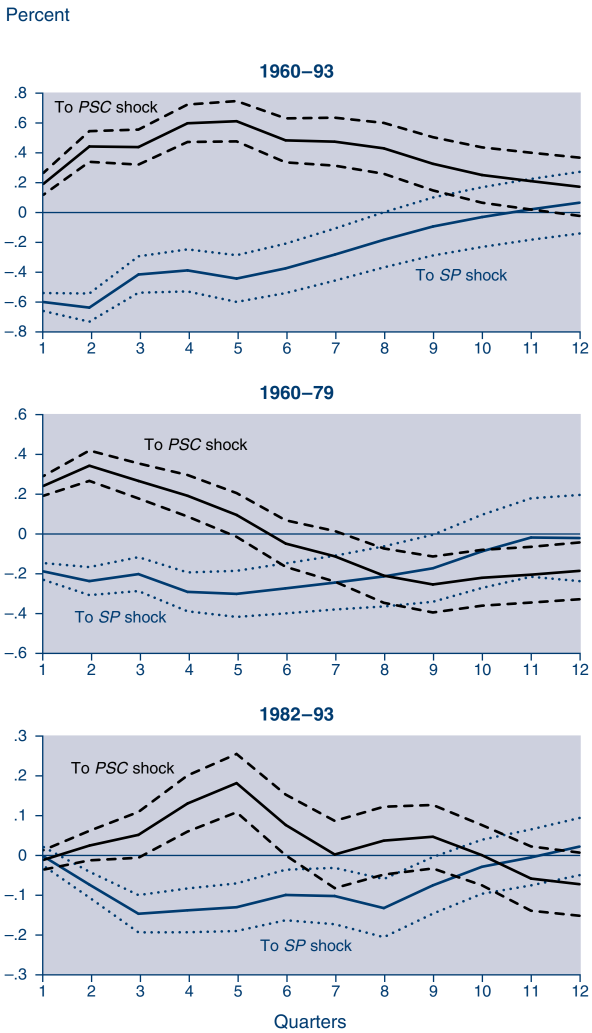
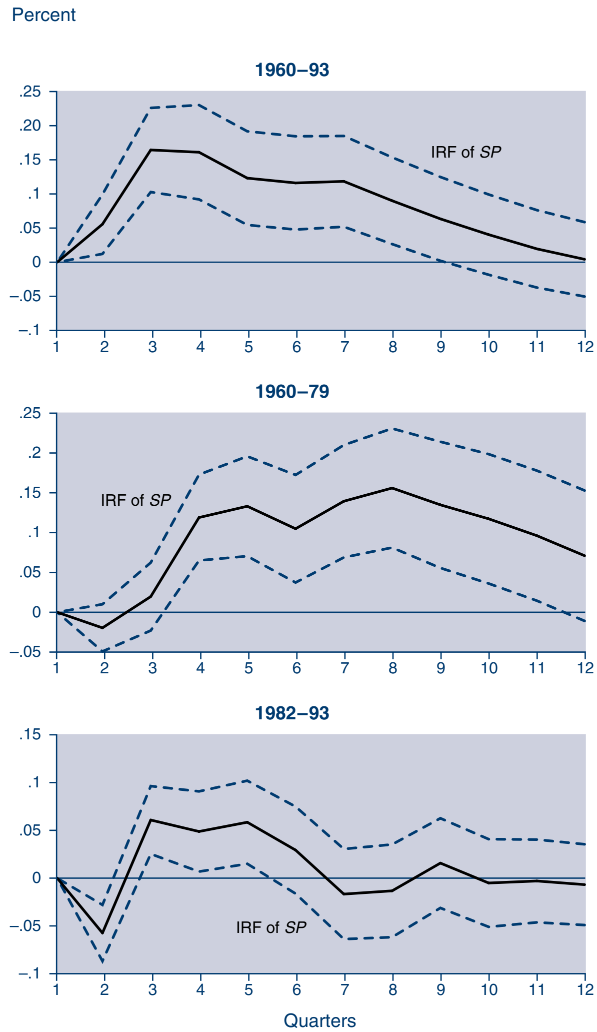


Figure 12
Impulse Response Functions Of Spread to Federal Funds Rate (Commodity Prices and Spread Included)



in anticipation of future inflation. However, it is consistent with the explanation that the Fed partially extinguishes the inflationary effects of a temporary supply shock. A temporary, negative supply shock, for example, would tend to cause the interest rate spread to fall as short-term real interest rates rise more than long-term real interest rates. At the same time the spread is falling, the Fed increases the federal funds rate to offset the inflationary effects of the supply shocks. This gives rise to the negative response of the federal funds rate to innovations in the interest rate spread.[13] The response to aggregate output and prices is also consistent with the supply shocks story as

[13] *Alternatively, the spread may decrease because of expectations that the Fed will tighten policy in response to a shock that increases prices and lowers output—namely, a supply shock.*

prices fall and output rises in response to a positive spread (supply) shock (*Figure 9*).

To determine the relative importance of the spread and commodity prices for explaining the price puzzle, especially in the later period, we estimate a VAR that includes both commodity prices and the interest rate spread.[14] Figure 10 displays the impulse response function of prices to shocks in the federal funds rate, and Figure 11 shows the response of the federal funds rate to shocks in commodity prices and the interest rate spread. For all three periods, the price puzzle no longer exists; prices respond negatively to a positive federal funds rate shock. Furthermore, the reaction of the federal funds rate to commodity price and interest rate spread shocks are consistent with the Fed tightening (at least initially) in response to an inflationary shock, in particular, supply shocks.[15] While we do not present the results here, the reaction of output and prices to commodity price shocks and interest rate shocks are consistent with those shocks reflecting supply-side shocks in the full and the 1960–79 samples. This interpretation is more tenuous in the post-1982 sample, as the response of GDP to commodity price and interest rate spread shocks is initially in the wrong direction for a supply shock.

Finally, an interesting result is that the interest rate spread rises in response to a federal funds rate innovation, particularly for the early sample period (*Figure 12*). This mirrors the response of the interest rate spread in spring 1994 as long-term interest rates rose more than short-term rates following an increase in the federal funds rate.

Conclusion

Using alternative approaches, we have documented a positive correlation between the federal funds rate and future inflation. Known as the "price puzzle," this positive correlation is surprising because increases in the federal funds rate, or tightenings in monetary policy, should theoretically lead to a lower, not a higher, price level. We have also documented that the price puzzle is much stronger during the pre-1980 period than since the early 1980s. In fact, the correlation between the funds rate changes and future price changes is close to zero in the later period.

We considered two explanations for the price puzzle. The first, from Sims (1992), is that the Federal Reserve systematically responds to expectations of higher future inflation by increasing the funds rate but not by enough to actually prevent inflation from rising. A second explanation is that the Federal Reserve systematically reacts to negative inflationary supply shocks by appropriately increasing the funds rate, but again, not by enough to extinguish the inflationary consequences of the shock.

We examine both of these explanations within a vector autoregression framework by including variables that may proxy for future inflation or supply shocks. While including commodity prices fully eliminates any price puzzle in the post-1980 period, the puzzle is still present in the pre-1980 period. We also find, however, that including the spread between ten-year and three-month Treasury rates eliminates the puzzle for both subsamples. Given the negative reaction of the funds rate to a shock in the spread, it appears that the spread is proxying for supply shocks rather than for increases in inflation expectations.

14 *We conducted formal tests of structural stability and tests for whether commodity prices and/or the spread Granger caused the other variables in the system. Once again, structural stability was rejected when the 1960–79 and post-1982 subsamples were considered. Both commodity prices and the spread, individually and jointly, provide information about future values of the other variables for the full sample. The joint exclusion of commodity prices and the spread is rejected in the 1960–79 sample, but the spread variable can be excluded at the 10-percent significance level. For the post-1982 sample, one can exclude commodity prices and the spread jointly and can exclude the spread (at the 5-percent level) and commodity prices (at the 5-percent but not at the 10-percent level) individually. Note that a formal rejection of Granger causality for both commodity prices and the spread in the later sample may be due to the rather large number of parameters implied by the seven-variable VAR relative to the number of observations in the post-1982 sample.*

15 *When the federal funds rate precedes the spread in the ordering, the response of the federal funds rate to a spread shock is still negative. Again, this is consistent with the Federal Reserve's tightening in response to a negative supply shock. However, for this ordering, the price puzzle remains in the 1960–79 sample.*

Thus, the implication is that the Federal Reserve responds to negative supply shocks by increasing the funds rate, but not by enough to fully offset the inflationary implications of the shock.

One interpretation of the muted price puzzle during the 1980s is that the Federal Reserve increased the weight it placed on price stability and reacted more strongly to inflationary shocks. Alternatively, it may be that the U.S. economy experienced fewer severe supply-side shocks during the 1980s, which allowed the Federal Reserve to avoid the difficult decisions associated with accepting either a run-up in prices or a larger short-run decline in output.

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