

# COMMODITY PRICES, INTEREST RATE SPREADS AND THE EXCHANGE RATE: USEFUL MONETARY POLICY INDICATORS OR REDUNDANT INFORMATION?

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## INTRODUCTION

In an uncertain world, information about the future is a scarce resource. Accordingly, monetary policymakers, like other economic agents, must make decisions today based on data about yesterday and educated “best guesses” about prevailing conditions and reactions tomorrow. The information is imperfect and incomplete, yet choices must be made. As Donald Kohn, a senior Federal Reserve staffer, puts it: “The practical question a monetary policymaker must continually ask is, how do I judge whether the instruments at my disposal are at the right settings to foster national economic objectives?” [1989, 53].

Much of the work on monetary policy, and the evolution of the Federal Reserve’s (hereafter, the Fed’s) actual conduct of monetary policy, can be best understood as ongoing attempts to grapple with the information problem. As the information content of the monetary aggregates seemed to deteriorate significantly over the 1980s,<sup>1</sup> it is not surprising that the Fed returned to a more eclectic and pragmatic approach to policymaking. Such flexibility has a price, however, and many inside and outside the Fed began to wonder about an approach to policymaking that was not firmly grounded or anchored — that is, policy discussions and actions increasingly appeared to be loosely rather than tightly tied to a specific set of objectives. As Benjamin Friedman observed, “it is difficult to escape the conclusion that there is now a conceptual vacuum at the center of the U.S. monetary policymaking process” [1988, 69].

To move toward filling the void, then Fed Governors Wayne Angell and Manuel Johnson suggested the need to explore alternative strategies and tactics for the conduct of monetary policy. More specifically, Angell proposed that commodity prices

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and other auction market variables be examined "as a guide to adjust short-run money growth target ranges" [1987, 1]. Similarly, Johnson [1988, 253] suggested that useful information about economic activity and the stance of monetary policy, and the appropriateness of that stance, might be obtained by *simultaneously* monitoring the movements of three auction market variables: the spread between long- and short-term interest rates, the foreign exchange value of the dollar, and an index of commodity prices.

The suggestions by Angell and Johnson spawned considerable research on the possible role of such variables in the conduct of monetary policy. The purpose of this paper is: (1) to review briefly the conceptual basis for using such "information variables" in the policy process; (2) to provide an overview of the empirical evidence which has helped to illuminate the relevant issues; and (3) to present a simple, yet powerful test of the usefulness of such variables within the policy process. Our results suggest that movements in such variables provide little incremental information about inflation and output growth beyond the information contained in policymaker forecasts.

#### AUCTION MARKET VARIABLES AS POLICY INDICATORS, INFORMATION VARIABLES AND POLICY TARGETS: AN ANALYTICAL OVERVIEW

Simply put, an information or indicator variable is a variable that policymakers can observe and which is correlated with another variable they cannot yet observe. Accordingly, by observing information/indicator variables—such as the monetary aggregates, interest rates, exchange rates, and commodity prices—policymakers can, in principle, become better informed about the current and near-term movements in real output and prices, and adjust policy appropriately. Two simple equations summarize the point:

$$(1) \quad \Delta \text{ Policy} = f(G - G^*),$$

where  $(G - G^*)$  is the gap between policymaker goals ( $G^*$ ) and the actual movement in the goal variables ( $G =$  Real output, prices, and employment)

$$(2) \quad (G - G^*) = h(\text{information or indicator variables})$$

By observing information variables available contemporaneously, and knowing their typical relation (correlation) with the  $G$  variables, policymakers can draw inferences about the  $(G - G^*)$  gap which is not yet observable. They can then adjust policy accordingly to minimize the gap between the actual and the desired movement in goal variables. In contrast to using intermediate monetary targets, this does not presume or require that the Fed use its policy instruments to achieve a particular target value for an information/indicator variable. Rather, the Fed monitors and "filters" a number of such variables — more formally, engages in "signal extraction" — and then reacts if and when it appears necessary. Put a bit differently, it is argued that by

focusing only on, say, an intermediate monetary target, the Fed ignores potentially useful information contained in the movement of other variables. The alleged inefficiencies of intermediate targeting and the usefulness of information/indicator variables are presented carefully in Bryant [1980] and Friedman [1990].<sup>2</sup>

With the above as background, the analytical and empirical work on the potential usefulness of various auction market (i.e., indicator) variables to the conduct of policy can be classified and reviewed. In general, the work falls into three broad areas. First, some argue that such variables are intermediate target candidates. Second, others suggest that such variables might help policymakers devise an appropriate reaction to an observed deviation between an intermediate monetary target (say 4 percent  $M2$  growth) and the actual value of such a variable (say, 5 percent growth). Third, it is argued that intermediate targets of any type process information inefficiently. Accordingly, these variables should only be used as information/indicator variables for the goal variables (e.g., inflation) in the sense outlined above.

The appeal of auction market variables as policy targets, indicators, or information variables, according to proponents, flows from several characteristics and considerations. First, the data on these variables are readily available, providing observable, timely, and accurate information that is not clouded by data revisions or seasonal adjustments. More specifically, "financial auction market prices reflect the consensus about the current and expected future values of financial instruments. As such, these prices serve as communicators of changing knowledge of market conditions" [Johnson, 1988, 256]. Second, reflecting the fact that these variables are determined in auction markets, it is argued that prices will respond more rapidly than, say, the CPI or GDP deflator, to real or financial shocks (policy-induced or otherwise), thereby yielding advance information of forthcoming changes in the overall inflation rate, and economic activity, more generally.

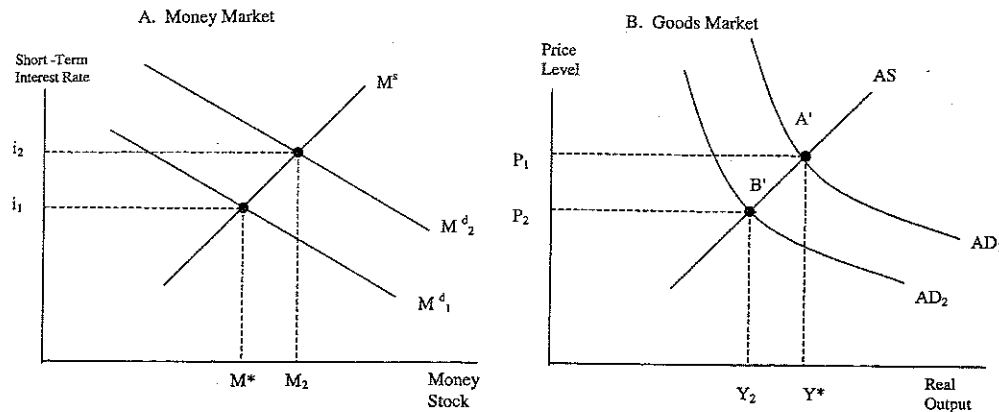
To illustrate, consider that within existing theoretical and empirical work on the term structure of interest rates, the spread between long- and short-term interest rates is thought to be indicative of the public's inflation expectations. Accordingly, with a positively sloped yield curve generally believed to reflect expectations of a rise in the inflation rate over time, a steepening of the yield curve might well indicate a more expansionary monetary policy or, more generally, a positive shock to aggregate demand.

Similarly, with the supply of commodities thought to be fairly inelastic in the short run, and with commodity prices set in flexible-price auction markets, it follows that shocks to demand, for example, will be quickly and directly reflected in movements in commodity prices. Since commodities are inputs into the production process of many final goods, such shocks to production costs will tend to lead movements in the overall price indices. Thus, monitoring/filtering movements in commodity prices has the potential for providing advance information on inflation and the possible need for compensating policy actions.<sup>3</sup>

The potential usefulness of auction market variables relative to intermediate monetary targets can be easily illustrated within the confines of the simplest of macro models. Assume initially that the Fed selects a dial setting for its intermediate monetary target ( $M^*$ ) which it believes is consistent with achieving its ultimate goal for

FIGURE 1

## On the Potential Usefulness of Information Variables



Initially, the Fed selects  $M^*$  for its monetary target, expecting this to be consistent with achieving its output target ( $Y^*$ ). Subsequently, there is a *positive portfolio shock* which disturbs the equilibrium in each market. More specifically, money demand increases (to  $M^d_2$ ) and aggregate demand falls (to  $AD_2$ ). Given an interest elastic money supply function and the fact that data on the overall price level and real output lag well behind the money stock data, the first thing policymakers will observe is  $M_2 > M^*$ . However, given the nature of the initiating disturbance, any attempt to reduce the supply of reserves (shifting  $M^s$  to the left), so as to push  $M$  back towards  $M^*$  will reduce aggregate demand further, thereby amplifying the deviation between  $Y$  and  $Y^*$ . Within the confines of a fairly standard, fully articulated macro model, however, the positive portfolio shock would also tend to lower commodity prices (the movement out of real assets would reduce the demand for commodities), flatten the yield curve (note the rise in the short-term rate above), and contribute to an appreciation of the dollar. Since the movement in these auction market prices is essentially the opposite of what one would expect to be consistent with a policy or spending shock (as can easily be verified), monitoring such variables and their movements would "inform" policymakers about the need to adjust  $M^*$  upwards.

output ( $Y^*$ ). Subsequently, it observes that the actual money stock ( $M$ ) exceeds  $M^*$ . Policymakers have two basic options: (1) Adjust their policy instruments so that  $M$  moves back towards  $M^*$ ; (2) Alter  $M^*$  — in effect, move  $M^*$  towards  $M$ . As can be easily illustrated, the optimal response depends on the source of the shock to  $M$ . The case of a positive portfolio shock — that is, an increase in money demand relative to the demand for other financial and real assets — is shown in Figure 1. Such an example demonstrates that not only can these auction market variables provide additional information which illuminates the current stance of policy, but the information can serve as an advance "audit" of previous econometric and judgmental predictions.<sup>4</sup> Not surprisingly, recent work on such relationships has been extensive.

## BRIEF OVERVIEW OF THE LITERATURE

Empirical tests of the relationship between auction market variables and policymaker goals has spanned the econometric spectrum from simple correlations to tests for cointegration and variance decompositions. In general, the results suggest that movements in these variables may contain useful information about inflationary expectations or future movements in real output and prices. However, apparent instabilities in the empirical relationships between these variables and policymaker

goals, and loose, rather than tight relationships between policy instruments and these variables, have also suggested that such variables are not strong candidates for actual target variables.

Our sense of the weight of research to date is that the general findings suggesting no cointegration between, say, commodity prices and the CPI, call into question the generally more supportive evidence found in the correlation and standard regression studies.<sup>5</sup> At the same time, however, the low power of the various tests employed, and the existence of some supporting evidence, taken together, lead us to conclude that the usefulness of such variables can not be definitively ruled out.

## TOWARDS A MORE DEFINITIVE ASSESSMENT OF THE USEFULNESS OF AUCTION-MARKET VARIABLES IN THE CONDUCT OF MONETARY POLICY

The mixed results found in the literature would suggest that one cannot reject the hypothesis that certain auction-market variables — specifically, the spread between long and short term interest rates, the dollar exchange rate, and commodity prices — may be useful in the conduct of monetary policy. Much of the recent empirical work has addressed whether information in the indicator variables today will help predict changes in economic activity in the future.<sup>6</sup> We believe establishing that such a statistical relationship exists is only the first step in determining the potential usefulness of an indicator variable to the policymaker. Despite the lack of consensus, if the answer to the above question is yes, then the policy implication is that monitoring these auction market variables should help improve forecast accuracy. What has not been established, however, is whether the information in these variables is actually useful to the policymaker. That is, will monitoring these variables actually inform policymakers about an incipient error in their forecast of economic performance?

What distinguishes our work from previous research is that we carry out a simple test of what we consider to be the more pertinent policy question: did the staff of the Federal Reserve adequately exploit the information in these variables? If they did not, and the information in these variables matters for policymaking, then movement in these variables will help to explain the variation in the Fed staff's errors in forecasting real output and inflation. We could conclude then that these variables have useful incremental information which could help policymakers adjust their policy instruments in a more timely fashion. If, however, the Fed staff already adequately accounts for the movement in these variables, then whatever information is contained in these variables should already be incorporated in their economic forecasts and should not be related to their forecast errors. Hence, monitoring these variables further would not significantly enhance the accuracy of the staff's forecasts, as the information in these variables would be largely redundant.

## The Forecasts

The Fed's staff prepares a complete macroeconomic forecast for each FOMC meeting.<sup>7</sup> We utilize their forecasts for the rate of change in the GNP deflator and the rate of change in real GNP.<sup>8</sup> More specifically, we employ the forecasts for one-quarter

TABLE 1  
Forecast Performances : Fed Staff and ASA-NBER

Forecast Horizon	Mean Error		Mean Absolute Error		Root Mean Squared Error	
	Fed	ASA-NBER	Fed	ASA-NBER	Fed	ASA-NBER
<b>One-Quarter-Ahead</b>						
Real GNP	0.05835	0.21929	2.50487	2.59183	3.36545	3.44915
GNP Deflator	0.33539	0.56471	1.13468	1.08176	1.43143	1.43426
<b>Year-Ahead Forecast Horizon</b>						
Real GNP	-0.34027	-0.27887	1.36514	2.22373	1.85681	2.83538
GNP Deflator	0.72355	0.76193	1.31227	1.02226	1.66768	1.32101

Number of observations—86, ASA-NBER; 97 for Fed Staff one-quarter ahead, 71 for year ahead.

ahead and for the year ahead. For example, the one-quarter-ahead forecast for 1980:Q1 is that forecast made immediately after the release of the preliminary data for the previous quarter (i.e., 1979:Q4). It is actually a forecast of the current quarter in that this forecast for 1980:Q1 was actually made on January 30 in preparation for the February 1980 FOMC meeting. The year-ahead forecast is a forecast for the forthcoming year. It is a forecast for the entire interval from the current quarter to four quarters ahead.

The one-quarter-ahead forecast errors will enable us to evaluate the usefulness of the proposed set of information/indicator variables over the short run horizons which seem to dominate policy deliberations and actions. The year-ahead forecast errors should reveal something about the usefulness of such variables over a time interval long enough to allow to some degree for lags in the effects of policy actions.<sup>9</sup>

To extend the basis of evaluation, the forecasts provided by the American Statistical Association and National Bureau of Economic Research were also utilized. The ASA-NBER forecasts for the rate of change in real GNP and the GNP deflator are examined over the 1968-1990 period.<sup>10</sup> The ASA-NBER conducted quarterly surveys of "members of the Business and Economic Statistics section of the American Statistical Association, who forecast on a regular basis." In particular, the median, rather than the mean, forecast from approximately forty members who submitted their forecasts each quarter were used. The participants were asked to forecast a number of major economic indicators, for one to five quarters ahead. [Citicorp Economic Database Directory, 1986, XI-1-1].

Table 1 presents the summary statistics for the forecast errors (actual values minus forecast values) for both sets of forecasts for inflation and real GNP over the one-quarter and year-ahead forecast horizons. All data are in percent changes and are expressed at seasonally adjusted annual rates. The actual data on prices and real output are from the *Citicorp Economic Data Base*. The size of the errors and their respective patterns parallel those computed and presented by Karamouzis and Lombra [1989], wherein they concluded the staff forecasts were as good or better than projections prepared by other forecasters and were clearly "state of the art."

### Empirical Work

In conducting the empirical work, suitable measures of the auction market variables had to be identified. Generally, we utilized a variety of measures employed in earlier research. For example, for the interest rate spread, we used the spread between the rates on the Treasury's three-month and one-month bills for the one-quarter-ahead analysis, while the spread between the rates on the Treasury's twelve-month and one-month bills was utilized in the year-ahead analysis. Alternatively, the spread between the Treasury's twelve-month bill yield and the Federal funds rate was used for both the one-quarter-ahead and year-ahead analyses. Similarly, we employed five different measures of commodity prices: the producer price index for all commodities; the producer price index for industrial commodities (less fuels); the producer price index for crude materials; the producer price index for lumber and wood products, and the producer price index for fuels and related products and power. Lastly, we utilized a trade-weighted index of the exchange value of the dollar against the currencies of the other G-10 countries. All the data for the auction market variables are monthly averages of daily figures. Figure 2 identifies the explanatory variables that were utilized.

In general, we estimated equation (3) with the real GNP growth forecast errors and inflation forecast errors as the dependent variables and the various auction market variables—entering individually and collectively, in levels, first differences, and, for commodity prices and the exchange rate, percentage changes—as the explanatory variables.

$$(3) \quad Y_t = a_0 + a_1 X_{t,j} + \epsilon_t$$

The full sample periods, running from 1966-1990 for the Fed data and 1968-1990 for the ASA-NBER data, were employed, along with various subperiods.<sup>11</sup> Of particular importance is the strategy we followed in aligning the forecast errors and the "information variables." In one set of regressions, we utilized data on the information variables released in the first month of a quarter. Since the forecasts were generally prepared at the end of the first month or the beginning of the second, data on these information variables should have been available to the forecasters. Hence, statistically significant coefficients here would suggest they had underutilized information available at the time forecasts were made.

The second and third set of regressions employ data on the information variables released during the second and third months of a quarter, respectively; this is information that became available after the forecasts had been prepared. Consequently, statistically significant coefficients here on individual variables would support the contention that monitoring such variables would provide an early warning of an incipient forecast error, thereby facilitating the possible adjustment of policy instruments.

### The Results

For the full sample period, as well as numerous sub-samples examined, the results are remarkably consistent. While statistically significant coefficients appear



50 basis points in the first month and 75 basis points in the third month, the +25 basis point steepening of the yield curve was utilized as an explanatory variable. Again, the explanatory power remains low, and no consistent pattern of statistically significant coefficients appears.<sup>12</sup> Therefore, the movements of these variables do not appear to provide the kind of useful information policymakers require for effective forecast revision. Table 2 presents a sample of the output generated; only statistically significant results are shown.

## CONCLUSION

The potential usefulness of various information/indicator variables in the actual conduct of monetary policy has been discussed for some time. In recent years, the focus has shifted from monetary aggregates to various auction market prices. Indeed, Fed Chairman Alan Greenspan has discussed the movement in commodity prices in recent interviews concerning monetary policy. In this paper, we argue that the previous work on the relationship between such variables and the variables capturing the overall performance of the economy, however inconclusive, can best be understood as work examining the necessary statistical relationship for such variables to be informative/useful. Our research improves on the work of others by employing actual forecast data rather than model-generated data. We then test the more stringent policy implications of previous work — that is, whether these variables can help to explain incipient errors in the forecasts developed by the Fed's staff and the ASA-NBER panel. We conduct a thorough analysis of various probable scenarios in which a relationship between these variables and the forecast errors might be established. But even after allowing for the development of "news" and for periods of recessions and oil shocks, we find no reliable pattern of a statistical relationship between the indicator variables and these forecast errors. Consequently, the evidence does not support the alleged usefulness of such variables in improving upon the forecasts we examine.

This does not mean such variables are useless. More specifically, rather than viewing these results as undermining the use of auction market variables, we believe it is more accurate to view these results as a reflection, for the most part, of forecasters who are processing the available information in these variables efficiently. The results indicate that these variables do not contain additional information beyond that which policymakers have already incorporated in their forecasts. Hence, monitoring these variables further, whether individually or simultaneously as proposed, will not significantly improve policymakers' economic forecasts.

## NOTES

We would like to thank Carol Scotese for her assistance with the data utilized in this paper.

1. For details, see Friedman [1988; 1993] and Lombra [1993].
2. Put in terms of modern time series analysis, information variables might well be cointegrated with the goal variables.

3. The possible usefulness of the exchange rate follows familiar lines. A depreciation, for example, can reflect an unplanned and unduly expansionary monetary policy which will raise aggregate demand and domestic prices relative to foreign prices. The resulting movements in the exchange rate and the domestic price level (current or future) are inversely related. Assuming the exchange rate is set in an efficient market, it follows that movements in the exchange rate contain information about prices.
4. Implicit in this example is the notion that a reliable statistical relationship exists between the auction market variables proposed as information/indicator variables and the goal variables which comprise the ultimate objectives of policymakers.
5. See, for example, Lown [1989], DeFina [1988], Garner [1988], Furlong [1989], Sephton [1991], Mishkin [1988], Laurent [1990], Webb [1988], Baillie [1989], and Hafer [1989]. For cautions, see Kliesen [1994] and Blough [1994].
6. The ability of interest rates and rate spreads to predict economic activity has received much attention, but again, with mixed results. Authors finding support for these relationships include Black, et al. [1998], Dueker [1997], Friedman and Kuttner [1993], Estrella and Mishkin [1995], and Haubrich and Dombrosky [1996]. Lapp [1997], Blough [1994] and Fuhrer [1993] provide interesting alternative analyses about the relationships which question the predictive ability of interest rates.
7. The process involved in preparing these forecasts is described in detail in Karamouzis and Lombra [1989]. All the Fed forecast data were obtained from internal Fed documents.
8. It wasn't until 1992 that the Commerce Department began to report Gross Domestic Product rather than Gross National Product as the primary measure of aggregate output. Hence, GNP is the output measure used here.
9. Our sample runs from 1966-1990 for the one-quarter-ahead analysis; 1966 is the earliest period for which data are available and the sample ends in 1990 in order to maintain continuity and comparability with the ASA-NBER set of forecasts. For the year-ahead analysis, our sample runs from 1970-1990 for the same reasons. In the early part of this period, the Fed met every 4-6 weeks; this means that there are usually three sets of forecasts each quarter for projection intervals from 1-6 quarters out. As time has passed, the Fed has met less frequently, averaging about 6-8 meetings per year in recent years. To standardize our sample with regard to the information available to policy makers at the time the staff prepared its forecasts, we utilized the forecasts made for the first FOMC meeting in a quarter following the release of the preliminary data for the previous quarter.
10. The first survey was collected in 1968:4. The ASA-NBER discontinued the survey in 1990. Later that year the Federal Reserve Bank of Philadelphia modified the survey, invited new forecasters, and began conducting the survey under its present name, *The Survey of Professional Forecasters*. See Croushore [1993] for more information on the survey. The sample period ends in 1990, consequently, to maintain consistency in the forecasts collected.
11. For example, the sample was split at 1979:3 to test whether the Fed's switch from using the federal funds rate to non-borrowed reserves as an operating target influenced the results. We tested for changes in the relationship using Chow tests and rolling regressions.
12. Given the lack of a systematic relationship between the variables being estimated, only a small sample of results is presented. However, the full set of regression results is available from the authors. It should be noted that we also constructed sample periods which exclude dates of the major oil shocks. We proceeded in this fashion to see if statistically significant coefficients on commodity indices that contain oil were largely a reflection of oil shocks. The latter is important because policy makers could not be expected to anticipate such shocks and, even more importantly, such shocks could dominate the regressions, suggesting a reliable relationship even in the absence of such shocks. The results confirm those found with price indices which exclude oil completely — there does not appear to be a reliable set of relationships among these variables. Sample periods which exclude dates of the major U.S. recessions (according to the NBER) were also examined for similar reasons. These results were also consistent with the general conclusions.

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