

# Introducing: The Survey of Professional Forecasters

*Dean Croushore\**

**F**orecasts play a crucial role in the economy. Businesses won't hire workers as readily if they think the economy may go into a recession soon. Long-term interest rates will rise if people in the financial markets expect inflation to increase. And firms are less likely to borrow money for new investment spending today if they think interest rates will soon decline.

Forecasts are important for many decisions, but not many people have the knowledge and experience to forecast economic variables well. It makes sense, therefore, for people to rely on the forecasts of experts. One easy way to get these forecasts is to subscribe to a survey of forecasts, such as the Survey of Professional Forecasters.

Every three months, the Federal Reserve Bank of Philadelphia takes a survey of forecasts of economic variables (including output, inflation, and interest rates) prepared by private sector economists—the Survey of Professional Forecasters. As the title suggests, the respondents are *professional* forecasters—those who produce regular forecasts of economic vari-

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\*Dean Croushore is assistant vice president in charge of the Macroeconomics Section of the Philadelphia Fed's Research Department. He thanks Victor Zarnowitz for useful comments on an earlier draft of this article. He also thanks the National Bureau of Economic Research and Professor Zarnowitz for their help and cooperation when the Philadelphia Fed took over the survey in 1990.

ables as part of their jobs in the business world or on Wall Street. This survey has proven to be valuable both for informing business firms and policymakers about the future direction of the economy and aiding economic researchers studying forecasting.

The American Statistical Association (ASA), together with the National Bureau of Economic Research (NBER), began conducting the survey (which came to be called the ASA/NBER Economic Outlook Survey) in the fourth quarter of 1968. In the early days, the survey attracted many forecasters, with over 50 participants each quarter in the first years of the survey's existence. As time went on, however, the number of participants declined, to fewer than 20 by 1988. After the first quarter of 1990, the ASA and NBER decided to discontinue the survey.

Later in 1990, the Federal Reserve Bank of Philadelphia revived the survey by inviting new forecasters into the survey, which boosted the number of participants into the 30s. We changed the dates at which the survey was mailed out and collected to make them consistent through time, and we modified the survey to ensure that everyone was forecasting the same set of variables. In addition, we added longer term forecasts of certain variables, including inflation. The survey's results are publicly released and are often reported in newspapers and on financial-market wire services.

### **WHY PEOPLE NEED FORECASTS**

Policymakers, business planners, investors, and homeowners all have specific uses for educated forecasts of the economy. Policymakers need to know what the future holds so that current policies can be formed appropriately. For example, monetary policy affects economic activity with a lag of six months or more and affects inflation with an even longer lag, so to make the proper policy decision today, the Federal Reserve must anticipate the state of the economy some months in the future. Similarly,

to decide on issues such as how much to increase their labor force or whether the demand for a proposed new product is likely to be sufficient, business planners need to know how likely it is that different sectors of the economy will expand or contract over the next several years. Financial markets are extremely sensitive to forecasts of changes in interest rates, firms' profits, and the rate of inflation. Even in personal planning decisions, such as whether to refinance a mortgage loan, forecasts of interest rates and other economic variables are quite useful.

The Survey of Professional Forecasters can help meet many of these needs. It is produced quarterly and is available to the public at no charge. It is released at the end of the second month of each quarter (or early the next month); for 1993, new surveys were released March 1, June 1, August 30, and November 29. For the press, the survey is released via PR Newswire. The results of the survey are often reported in major newspapers, including the Wall Street Journal, and on financial newswires.

### **WHAT ECONOMIC VARIABLES ARE FORECAST?**

In the first survey, conducted in the fourth quarter of 1968, participants were asked to forecast 10 variables for the next five quarters. For example, survey respondents predicted the level of nominal gross national product (GNP) for the fourth quarter of 1968 and for all four quarters of 1969. The survey was restructured in 1981, adding some new variables, dropping some others, and adding annual forecasts. In 1992 the main aggregate output variable was changed from GNP to GDP (gross domestic product). Currently there are 27 different forecast variables included in the survey (Table).

In addition to the standard quarterly and annual forecasts, the forecasters are asked to predict two other types of variables: *probability variables* and (newly added) *long-term forecasts*. The "GDP Probability" and "Deflator Probabil-

**TABLE**  
**Variables Included in the Survey of Professional Forecasters**

	Data Availability		Data Availability
<b>U.S. Business Indicators</b>		<b>Probability Variables</b>	
Gross Domestic Product (GDP)	A	GDP Probability	D
GDP Implicit Price Deflator	A	Deflator Probability	D
Corporate Profits After Taxes	A	Recession Probability	D
Civilian Unemployment Rate	A		
Industrial Production Index	A	<b>Long-Term (10-Year) Forecasts</b>	
Housing Starts	A	Consumer Price Index	E
Consumer Price Index Inflation Rate	B	Real GDP	F
3-Month Treasury Bill Interest Rate	B	Productivity Growth	F
AAA Corporate Bond Yield	B	Stock Return (S&P 500)	F
10-Year Treasury Bond Interest Rate	C	10-Year Treasury Bond Return	F
		3-Month Treasury Bill Return	F
<b>Real GDP and Its Components (all series adjusted for inflation)</b>		<b>Variables Deleted From the Survey</b>	
Real Gross Domestic Product	B	Plant and Equipment Expenditures	G
Personal Consumption Expenditures	B	Change in Business Inventories (nominal)	G
Nonresidential Fixed Investment	B	Durable Goods Expenditures	G
Residential Fixed Investment	B	National Defense Purchases	G
Federal Government Purchases	B		
State and Local Government Purchases	B		
Change in Business Inventories	B		
Net Exports of Goods and Services	B		

**Data Availability:**

- A Quarterly forecasts begin fourth quarter 1968; annual forecasts begin third quarter 1981
- B Beginning third quarter 1981 for both quarterly and annual forecasts
- C Beginning first quarter 1992 for both quarterly and annual forecasts
- D Beginning fourth quarter 1968
- E Beginning fourth quarter 1991
- F Beginning first quarter 1992; collected only in the first quarter each year
- G Collected from the fourth quarter of 1968 to the second quarter of 1981; quarterly forecasts only

ity” variables reflect the degree of uncertainty in each respondent’s forecast. These variables show the probability that real GDP and the GDP deflator will fall into particular categories of growth rates. For example, in recent surveys, the forecasters were asked to indicate what probability they would attach to real GDP’s

rising 6 percent or more, 5.0 to 5.9 percent, 4.0 to 4.9 percent, 3.0 to 3.9 percent, 2.0 to 2.9 percent, 1.0 to 1.9 percent, 0.0 to 0.9 percent, -1.0 to -0.1 percent, -2.0 to -1.1 percent, and declining more than 2 percent. Someone with a forecast of 3.5 percent real GDP growth might say that there is a 50 percent probability that

real GDP will grow 3.0 to 3.9 percent, 20 percent probability of 4.0 to 4.9 percent growth, 5 percent probability of 5.0 to 5.9 percent growth, 20 percent probability of 2.0 to 2.9 percent growth, and 5 percent probability of 1.0 to 1.9 percent growth.

These probability categories provide important information to business people and policymakers, who often need not just a point forecast but also some idea of how much uncertainty there is about the forecast. Looking at how much the forecasts differ across forecasters gives some indication of uncertainty. But only the probability questions in the Survey of Professional Forecasters provide information on how uncertain each respondent is about her or his own forecast.<sup>1</sup>

Forecasters are also asked how likely they think it is that real GDP will decline in the current quarter or in any of the next four quarters. We call this a "Recession Probability," though that is not completely accurate, since real GDP can decline in one quarter without the economy being in a recession. A rule of thumb suggests that a recession occurs when there is a decline in real GDP for two consecutive quarters.

Recently, the survey has begun asking participants for long-term forecasts of some variables. The survey asks respondents to forecast the average, over the next 10 years, of the CPI inflation rate, the real GDP growth rate, the rate of productivity growth, the rate of return on corporate stock, the yield on 10-year Treasury bonds, and the yield on three-month Treasury bills.<sup>2</sup>

In addition to these specific variables for which there is a quantitative response, we ask

the participants for their general opinions about fiscal policy, monetary policy, international influences, and other factors that affect their forecasts. Occasionally, we ask a particular question about the state of the economy that isn't reflected in the other questions on the survey. For example, we have asked whether the participants thought the economy was in recession, then later asked whether they thought the recession was over.

The Economic Research Division of the Federal Reserve Bank of Philadelphia maintains a complete data base on all the survey results, including all the data from 1968 to 1990 when the ASA and NBER ran the survey. All the data are available on this web site.

#### **WHO ARE THE FORECASTERS?**

The forecasters in the Survey of Professional Forecasters come largely from the business world and Wall Street. For example, out of 36 participants in a recent survey, 13 were from Wall Street financial firms, eight from banks, five from economic consulting firms, three from university research centers, and seven from other private firms, including chief economists at many Fortune 500 companies. This diverse group of forecasters shares one thing in common: they forecast as part of their current jobs. And they do so, according to Zarnowitz and Braun (1992), using statistical (econometric) models, other people's forecasts, leading indicators, and surveys such as the Consumer Confidence Index.

One important feature of the Survey of Professional Forecasters is anonymity of the forecasters. We do not release the names of any

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<sup>1</sup> Research by Zarnowitz and Lambros (1987) suggests that measuring forecast uncertainty by the variation in forecasts across forecasters understates uncertainty, compared with measuring it using the survey's probability variables.

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<sup>2</sup> Because these variables are not expected to change much from quarter to quarter, we include all but one of these variables in the survey just once a year (in the first quarter). The exception is the long-term CPI inflation rate, which we ask about every time because of its importance and because inflation expectations seem to change rapidly.

## For Further Information

To get your name on the mailing list to receive the survey, write to: Publications Desk, Research Division, Federal Reserve Bank of Philadelphia, Ten Independence Mall, Philadelphia, PA 19106.

To get data sets from the survey or to inquire about the possibility of becoming a panelist in the survey, write to Dean Croushore, Research Officer and Economist, Federal Reserve Bank of Philadelphia, Ten Independence Mall, Philadelphia, PA 19106. Two types of data sets are available: median data and individual data. The median data set provides the median values across forecasters for each variable in each survey over time. This data set is small enough to fit on one floppy disk and can be sent immediately upon request. The individual data set, containing every individual's response for each variable in each survey, is much larger; if you specify which variable(s) you are interested in, we will send that subset of the data.

participants in the survey.<sup>3</sup> This anonymity is designed to encourage people to provide their best forecasts, without fearing the consequences of making forecast errors. In this way, an economist can feel comfortable in forecasting what she really believes will happen to interest rates, even if it contradicts her firm's official position. Also, the participants are more likely to take an extreme position that they believe in (for example, that real GDP will grow 5 percent in 1994), without feeling pressure to conform to the consensus forecast. The negative side of providing anonymity, of course, is that the

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<sup>3</sup>Even though the names of the forecasters are not given as part of the data set, each forecaster is identified by a code number, so that a researcher can follow the forecasts of a particular forecaster over time.

forecasters can't claim credit for particularly good forecast performance, nor can they be held accountable for particularly bad forecasts. Some economists feel that without accountability, forecasters may make less accurate predictions because there are fewer consequences to making poor forecasts.

## HOW THE SURVEY OF PROFESSIONAL FORECASTERS COMPARES WITH OTHER SURVEYS

Other surveys useful to the public and readily available include the Livingston Survey, Blue Chip Economic Indicators, and the National Association of Business Economists (NABE) Outlook.<sup>4</sup> The NABE Outlook is the closest to the Survey of Professional Forecasters in that it comes out quarterly, surveys professional forecasters, and maintains the anonymity of the individual forecasters. The Blue Chip survey provides a very useful forecast survey on a monthly basis, forecasting many important macroeconomic data series and including long-run forecasts twice a year. The semi-annual Livingston Survey has many variables in common with the Survey of Professional Forecasters.<sup>5</sup>

There are several key differences between the Survey of Professional Forecasters and these other surveys. The NABE Outlook forecasts

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<sup>4</sup>These are the most well-known forecast surveys for the U.S. economy. In addition, there are several international forecast surveys that include forecasts for the U.S., such as Economic Forecasts: A Worldwide Survey and Consensus Forecasts. Also, there are many private forecasting firms, such as DRI and WEFA, that provide more detailed and more frequent forecasts than do the surveys. The higher price for such a service also buys you expert help in interpreting and understanding the forecasts; surveys do not provide such help.

<sup>5</sup>For historical information on the Livingston Survey, see Taylor (1992). The Philadelphia Fed also produces the Livingston Survey.

only annual averages for most variables, while the Survey of Professional Forecasters forecasts quarterly detail. The Blue Chip survey does not preserve the anonymity of the forecasters, and for economic researchers studying inflation, the fact that the Blue Chip survey didn't begin until 1976 is a disadvantage, as it misses the first OPEC oil shock of 1973-74 and the runup of inflation in the late 1960s. The Livingston Survey provides forecasts over six-month periods, which may not be as useful as quarterly forecasts to some people (especially researchers). But the Livingston Survey began in 1946, so it offers a long historical record of forecasts for research use.<sup>6</sup>

#### HOW THE SURVEY IS USED IN PRACTICE

**Labor Contracts.** Employers and labor organizations use surveys of forecasts in setting wage contracts. Because wages are often determined for periods as long as three years ahead, people would like to have a reliable forecast of inflation so that they can set wages while allowing for expected changes in the cost of living. Because the Survey of Professional Forecasters has a good track record in forecasting (see *Measures of the Survey's Accuracy*), and because the survey's median forecast is generally more accurate than any one individual's forecast, the survey has been used by some firms and unions in negotiating wages.<sup>7</sup>

**Business Planning.** Before business firms

undertake a major project, such as introducing a new product line or making a new capital investment, they need to forecast not only the likely value of the product or capital item itself, but also how good the overall business climate is likely to be. A recession can easily overwhelm even the best-laid plans for a new investment. And starting up a new product line when the economy is about to turn down may reduce the product's chances of success. For that reason, using the forecasts of real GDP or recession probability in the Survey of Professional Forecasters may be beneficial.

**Household Finance.** Individuals may find the survey useful for their personal finances. If you are thinking about refinancing your mortgage, the survey gives you information about forecasters' beliefs about the likely direction of long-term and short-term interest rates. Or if you are thinking about how much to save for retirement, you can get some forecasts of rates of inflation and returns on stocks and bonds over the long run.

**Tracking Inflation Expectations.** Economic theory tells us that people's inflation expectations can affect the response of the economy to changes in monetary policy. One reason the Philadelphia Fed took over the Survey of Professional Forecasters from the ASA and NBER in 1990 was to continue the historical series on inflation expectations. The survey provides useful inflation forecasts in the short term (one-, two-, three-, and four-quarters ahead) and the long term (over the next 10 years).

**Calculating Real Interest Rates.** Economists have found that real interest rates (nominal interest rates less expected inflation) are important in determining such things as the amount of investment spending that businesses undertake and the amount of borrowing that consumers are willing to do. The gap between nominal interest rates and real interest rates is the inflation premium; it goes toward repaying the lender for the purchasing power that is lost to inflation over the life of the loan. Since we

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<sup>6</sup> Carlson (1977) describes some problems in using and interpreting the Livingston Survey data. These problems were corrected in 1992.

<sup>7</sup> Research on the quality of inflation forecasts in the survey is mixed. Some researchers find the forecasts to be quite good, while others find them to be biased at times. Of course, there are no guarantees that the Survey of Professional Forecasters or any other survey of forecasts will be as accurate and unbiased in the future as it has been in the past.



How accurate are the forecasts in the Survey of Professional Forecasters? We claim the survey is fairly accurate, but how do we measure this?

To begin, we must calculate the forecast error, which is defined as the actual value of a variable minus the forecasted value. For example, if I forecast in November 1991 that the CPI inflation rate for 1992 will be 4.0 percent, and in fact it turns out to be 2.9 percent, my forecast error is -1.1 percent (note that we don't know the forecast error until 1992 is over and the government releases the actual data on 1992 CPI inflation).

Forecast errors arise for many reasons; mostly, the future is just difficult to predict. In particular, inflation is difficult to predict because events like the OPEC oil-price hikes can cause sudden changes in inflation. Real GDP growth is difficult to predict because while economists understand many of the causes of recessions, predicting the exact date at which a recession will begin has proven to be very difficult. While continued study by economists gives us more information about how the economy works and thus better forecasts, there will always be events that cannot be predicted.

Accuracy in forecasting can be measured in a variety of ways, the two most common being mean absolute error and root mean square error. Mean absolute error (MAE) is found by calculating the average size (absolute value) of the forecast errors over time. Root mean square error (RMSE) is found by squaring the forecast errors, calculating their average value, then taking the square root. For both MAE and RMSE, the larger the number is, the worse the forecast accuracy is. The measures are similar, although using the RMSE to measure accuracy gives a bigger penalty to large errors than does the MAE.

The table at right reports data from Zarnowitz and Braun (1992), comparing the accuracy of the average of individual forecasts in the Survey of Professional Forecasters (SPF) to two other well-known forecasters, identified here only as A and B.

There are several interesting results from these forecast accuracy comparisons. First, notice that forecast accuracy varies a lot depending on the time period. The MAE and RMSE for real GDP from 1970 to 1990 for the Survey of Professional Forecasters are quite a bit higher than those from 1976 to 1990, because the early 1970s contained both an unexpected rise in inflation (from the first OPEC oil shock) and a recession (from November 1973 to March 1975), which was hard to predict. Second, notice that the Survey of Professional Forecasters was more accurate than forecaster A for real GDP and inflation, but less accurate for the unemployment rate. This is a result found quite frequently in studies of forecast accuracy—no one forecaster is superior at forecasting all variables.

It is important to realize that any comparison of forecast accuracy depends on the timing of when forecasts were made. Forecasts made with more information are usually more accurate, so in making comparisons of one forecast with another it is important to verify when the forecasts were made. For example, if forecaster A made a forecast on the 10th day of each month, while forecaster B made a forecast on the 24th day of the month, forecaster B would have a built-in advantage, because she would have more data on which to base her forecasts every month. Because forecasters make their forecasts at different times, comparing accuracy is difficult.

Finally, the choice of which data to use in examining forecast accuracy is also important. Many government-produced data series get revised over time because more complete data become available, because seasonal adjustment factors are changed, or because base years are changed. For example, real GDP growth for the fourth quarter of 1990 was released initially on January 25, 1991, revised on February 27 and on March 27, then revised (including a change in the base year from 1982 dollars to 1987 dollars) on December 4, again on July 30, 1992, and again on August 31, 1993. So to examine the accuracy of a forecast of real GDP growth requires a choice of which data to use in calculating the forecast error—and different choices may make a significant difference in measuring forecast accuracy.

Variable	Period	Name of Forecaster	MAE		RMSE	
			SPF	Forecaster	SPF	Forecaster
Real GDP	'70-'90	A	1.32	1.58	1.89	2.18
Inflation	'70-'90	A	1.12	1.40	1.56	1.98
Unemployment	'68-'90	A	0.61	0.58	0.85	0.78
Real GDP	'76-'90	B	1.12	1.53	1.57	1.90
Inflation	'76-'90	B	0.89	1.05	1.06	1.33

can observe the level of nominal interest rates in the market, we can infer what real interest rates are by using the Survey of Professional Forecasters to measure expected inflation. Real interest rates for each quarter from the first quarter of 1984 to the fourth quarter of 1992 are shown for government bonds with 10 years to maturity (Figure 1) and for bonds with one year to maturity (Figure 2). The figures show a clear downward trend in real interest rates over the past three years, which has begun to promote business investment and consumer borrowing.

### HOW THE SURVEY IS USED IN ACADEMIC RESEARCH

The Survey of Professional Forecasters is increasingly used in research by academic economists who are investigating such questions as: Do forecasters correct their mistakes over time? Do their forecasts incorporate all available information? Are the forecasts biased in any way? What techniques of forecasting lead to the smallest errors? These questions are important because forecasts of economic variables affect the response of the economy to changes in monetary and fiscal policy. Research results on these questions are also important to people who use the forecasts, as they attest to the reliability and accuracy of the forecasts.

One economist who has used the Survey of Professional Forecasters extensively for examining these issues is Victor Zarnowitz of the University of Chicago and the NBER. He was involved in tabulating, analyzing, and evaluating the results of the survey from its inception in 1968 through early 1990. During the quarter-century since 1968, Zarnowitz has published many research results based on the survey.<sup>8</sup>

The most comprehensive research study of

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<sup>8</sup> I will discuss some of these results briefly here. Other results can be found in Zarnowitz's research papers, many of which are summarized in Zarnowitz (1992).

the survey is that of Zarnowitz and Braun (1992). They provide a wealth of analysis about the survey, including the following results: (1) Forecast errors generally increase as the number of periods in the forecast horizon increases (not surprisingly, it's harder to make accurate predictions further into the future); (2) Some macroeconomic variables (such as real GNP) are much easier to forecast than others (such as changes in business inventories); (3) Forecasters today don't seem any better than their predecessors (despite having more powerful computers and more modern economic theories); (4) Combining the forecasts of many individuals (by taking the mean or median) provides a consensus forecast with lower average errors than most individual forecasts (so it is important that the survey include many participants); (5) The survey compares favorably in forecast accuracy in comparison with a variety of econometric and time-series models (see *Measures of the Survey's Accuracy*).

Earlier, Zarnowitz (1985) published a study that tested the survey forecasts for bias, that is, whether the forecast error was zero on average, which we would expect if forecasts were formed rationally, i.e., if repeated mistakes are corrected over time. He found that 85 percent of the forecasts he looked at were unbiased. Of the forecasts that were biased, half were forecasts of inflation, which was often underpredicted.<sup>9</sup> Inflation seems to be a particularly difficult variable to forecast.

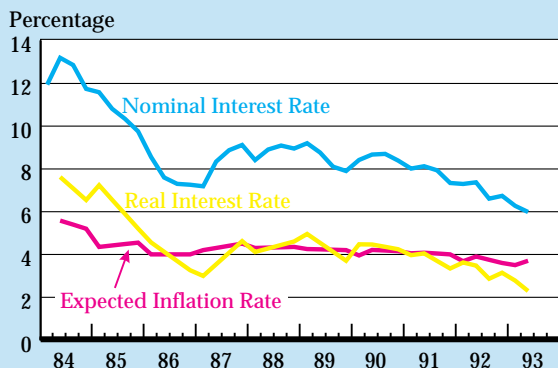
Besides Zarnowitz, other researchers have used the survey to examine forecasters' abilities. (See *Additional Research Using the Survey of*

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<sup>9</sup> Most forecast-bias studies whose data sets consist primarily of data from the 1970s find biased forecasts for inflation, largely because of the unexpected OPEC oil shocks, which drove up the rate of inflation. But it is difficult to imagine that anyone could have foreseen these oil shocks, so the finding of biased forecasts may be due to the special events of the 1970s. In the 1980s, the forecasts show no bias.

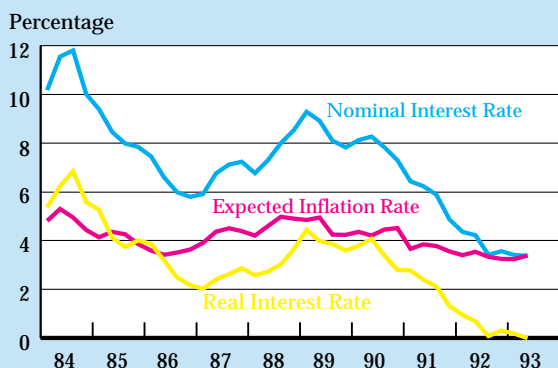


**FIGURE 1**  
**Nominal and Real Interest Rates**  
**on Ten-Year Government Bonds**



Sources: Nominal interest rate: Federal Reserve 10-year constant maturity series; Expected inflation rate: 10-year consumer-price inflation forecast for 1984Q2-1991Q1 (except 1990Q2) from Blue Chip Economic Indicators, 1990Q2 and 1991Q2 from Livingston Survey, 1991Q4-on from Survey of Professional Forecasters; Real interest rate = Nominal interest rate minus expected inflation.

**FIGURE 2**  
**Nominal and Real Interest Rates**  
**on One-Year Government Bonds**



Sources: Nominal interest rate: Federal Reserve one-year constant maturity series; Expected inflation rate: one-year consumer-price inflation forecast from Survey of Professional Forecasters; Real interest rate = Nominal interest rate minus expected inflation.

*Professional Forecasters.*)

As time passes and the survey accumulates more data, the long-range forecasts are likely to prove particularly useful to economic researchers. This is especially true of the inflation forecasts, which can be used in studies that examine how changes in monetary policy affect inflation expectations or studies that need calculations of real interest rates. A problem with short-range inflation forecasts (like the one-year forecasts of most surveys) is that government policy can have little impact on inflation over such a short span. For example, if the Federal Reserve indicates to the public that it is tightening monetary policy today to reduce inflation, little change is likely to occur in the one-year-ahead inflation forecast because a change in monetary policy takes a longer time to affect inflation. But if forecasters believe that the Fed will reduce inflation, this should affect their long-range forecasts of inflation. So researchers studying the effects of monetary policy on the economy will find more value in long-range forecasts than in short-range forecasts.

**CONCLUSION**

The Survey of Professional Forecasters is a continuation of the ASA/NBER Economic Outlook Survey. The Phila-

delphia Fed, which took over the survey in 1990, has a complete data set on the forecasts of professional forecasters, starting with the fourth quarter of 1968. The survey is a useful tool for policymakers, business people, and private citi-

zens to help them in making decisions. Researchers studying forecasting value it as well. The Federal Reserve Bank of Philadelphia plans to continue producing this survey.

## Additional Research Using the Survey of Professional Forecasters

### Research Study:

Hafer and Hein (1985)

Keane and Runkle (1990)

Lahiri and Teigland (1987)

Lahiri, Teigland, and Zaporowski (1988)

McNees (1992)

Rudin (1992)

Su and Su (1975)

### Main Results:

The survey provides better forecasts for inflation than do interest-rate-based models or econometric time-series models.

Forecasts of individual forecasters in the survey are consistent with rational expectations; that is, the forecasters do not leave useful information unexploited.

Forecasts aren't normally distributed, but are skewed.

Real interest rates decline when there is increased uncertainty about inflation.

Forecast errors are much larger during business-cycle turning points than during normal times.

Simple time-series models are inconsistent with the survey's forecasts, and there is a great deal of diversity in forecasters' beliefs.

The survey forecasts are superior to forecasts from econometric time-series models and the survey is better at forecasting *changes* in the levels of the data than at forecasting the levels themselves.

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