# Fifty Years of the Survey of Professional Forecasters

Over the past half-century, the Survey of Professional Forecasters has asked—and helped answer—some of the most important questions about our economy.

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BY DEAN CROUSHORE AND TOM STARK

The Survey of Professional Forecasters (SPF) was created 50 years ago and provides a long track record of macroeconomic forecasts. Over many decades, the survey has not only provided timely information for policymakers and other economic analysts but also helped answer numerous research questions. This article describes the survey's structure, provides a short history of the survey, highlights some of the major ways in which the survey has been used by researchers, and discusses the relationship between the survey and the Real-Time Data Set for Macroeconomists (RTDSM).

## The Survey's Structure

The staff of the Real-Time Data Research Center at the Federal Reserve Bank of Philadelphia sends surveys to professional forecasters around the country once each quarter, immediately after the U.S. Bureau of Economic Analysis (BEA) releases data on the previous quarter's value of gross domestic product (GDP). Currently, the forecasters are given just over a week to send in their forecasts. The survey staff then quickly compiles the results and generally releases the results to the press and the public immediately. For example, the survey staff released the First Quarter 2018 survey results just 14 days after the BEA released GDP for the second quarter of 2019 and just three days after the survey deadline (Figure 1).

The respondents forecast a rich set of variables. These forecasts are for the values the variables will take in the upcoming quarters and the upcoming years.

The forecasts for these variables are all point forecasts, which means they are the forecasters' projections of the variable for a given date. The forecasters provide these point forecasts for the current quarter and each of the next four quarters. They also provide point forecasts for the annual average for the current year and the next year. For some variables, the annual forecasts cover the following two years, as well. For example, forecasters responding to the Third Quarter 2019 survey provided point forecasts for the unemployment rates in the third and fourth quarters of 2019 and the first, second, and third quarters of 2020, and for the annual average unemployment rates in 2019, 2020, 2021, and 2022 (Figure 2).
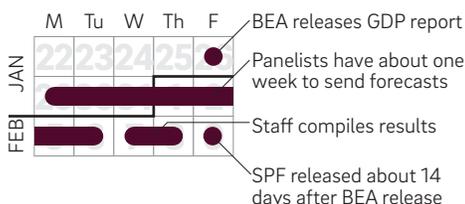
Forecasters also provide a variety of other forecasts. One is a probability

**FIGURE 1**

## The SPF's Fast Turnaround

Currently, the Fed releases the SPF two weeks after the BEA releases its first GDP report for each quarter.

**Representative Example:** 2018 Q1



BEA releases GDP report

Panelists have about one week to send forecasts

Staff compiles results
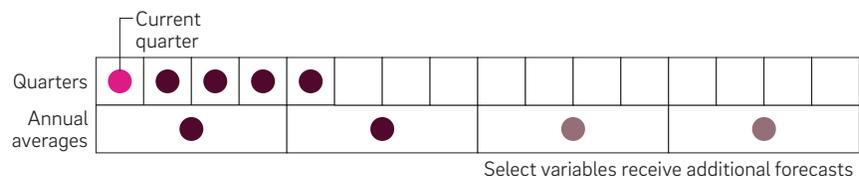
SPF released about 14 days after BEA release

The timeline typically straddles two months

**FIGURE 2**

## Forecast Horizon in a First-Quarter Survey

Forecasters provide point forecasts for current quarter as well as upcoming quarters and years.



Select variables receive additional forecasts

forecast, which, unlike a point forecast, refers to the possibility that a variable falls within a given range. For example, Figure 3 shows a probability forecast for real GDP growth for the year 2020 from the Third Quarter 2019 survey. The numbers on the horizontal axis are the ranges, which vary from less than −3 percent to greater than 5.9 percent. Each forecaster supplies a probability for each range. For example, a forecaster might give a 30 percent probability that GDP growth will be between 2.0 percent and 2.9 percent. Then, the survey staff averages those probabilities across forecasters to get the graph shown in Figure 3. The blue bars show the average probabilities across forecasters in the Third Quarter 2019 survey, while the red bars show the probabilities from the Second Quarter 2019 survey three months earlier. A comparison of the red and blue bars gives the reader insight into how the forecasts have changed from one quarter to the next. In Figure 3, the probabilities from some of the higher ranges have declined, while those for some of the lower ranges have increased, suggesting an increased probability that GDP growth will be lower than was forecast in the previous survey. The forecasters provide probability forecasts

for real GDP growth, the unemployment rate, and the inflation rate.

Forecasters also provide long-term forecasts for various variables. These forecasts cover many more periods in the future than just the next few years. For example, in every survey, forecasters provide a 10-year-ahead forecast for inflation. Figure 4 shows what those forecasts have looked like since 1991. The red line shows, at each date, the forecast for the average annual inflation rate for the following 10 years. The shaded area shows where the middle 50 percent of the forecasts lie. The graph shows the general decline in the forecasted long-term inflation rate, from about 4 percent in the early 1990s to just over 2 percent in more recent years. The shaded area also generally narrows over time, showing that disagreement among forecasters about the long-term rate of inflation has also declined.

In each survey, forecasters also estimate the probability that real GDP will decline in the current quarter and in each of the following four quarters. For example, a forecaster who thinks a recession is coming later in the year might report a probability of a decline in real GDP of 20 percent in the current quarter, 40 percent next quarter, 60 percent two quarters

ahead, 80 percent three quarters ahead, and 90 percent four quarters from now. The survey reports the average of those probabilities across forecasters. This information can be used to explore the likelihood of a future recession. In one enterprising use of the data, David Leonhardt of the *New York Times*, in a 2002 article, created the Anxious Index, which plots the average probability for a decline in real GDP across the SPF forecasters in the first quarter after the survey was taken. Figure 5 shows the value of the Anxious Index from 1968 to 2019. The gray bars indicate periods of recession. Clearly, the Anxious Index typically rises during recessions and sometimes even signals a coming recession.

The four types of forecasts described so far–point forecasts, probability forecasts, long-term forecasts, and GDP decline forecasts–are reported in each survey. In addition, the survey asks a number of special questions–some during one survey each year and others on an occasional basis depending on the current economic situation. There are two regular questions asked once each year about the following: 10-year annual-average forecasts for 1) real GDP growth, 2) productivity growth, 3) returns to the S&P 500 stock index, and 4)

## Probability Forecasts from Two Consecutive Surveys

Between second and third quarters of 2019, forecasters raised the probability of GDP growth at the lower ranges.

Mean probabilities, percent, for real GDP growth range (year over year) in 2020, Second Quarter 2019 and Third Quarter 2019 surveys
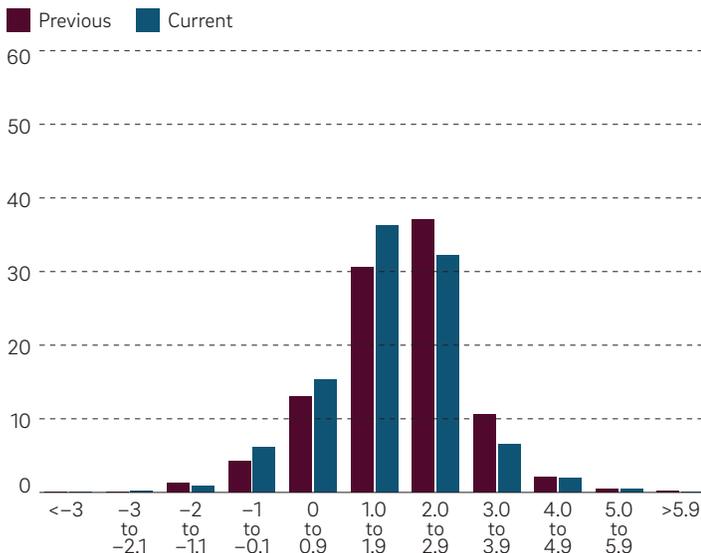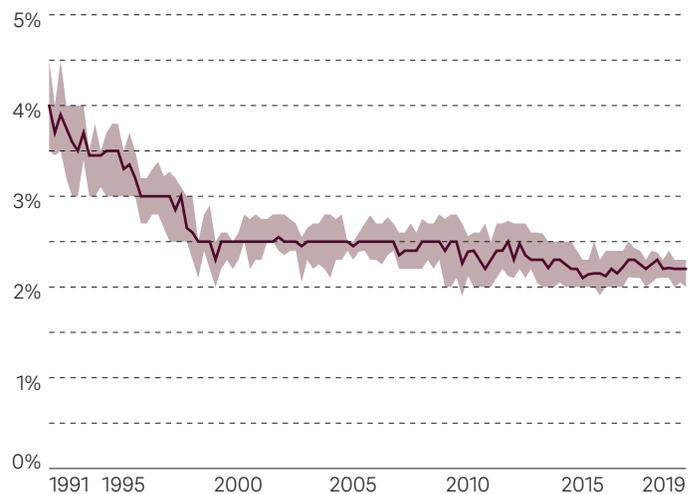


**Source:** Real-Time Data Research Center, Federal Reserve Bank of Philadelphia.

## Ten-Year Forecasts of Inflation

Long-term inflation forecasts have declined, and so has disagreement among forecasters.

Projections for the 10-year annual-average rate of CPI inflation (median and interquartile range), quarterly survey dates fourth-quarter 1991 to third-quarter 2019



**Source:** Real-Time Data Research Center, Federal Reserve Bank of Philadelphia.

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2019 Q4

interest rates on three-month Treasury bills and 10-year Treasury bonds; and estimates of the natural rate of unemployment, or what the unemployment rate would be in the absence of major shocks to the economy, such as those that cause recessions.

The survey also asks questions relevant to current developments in the economy. Particularly notable special questions have included: (1) forecasts of housing prices, initially asked in the first-quarter survey in 2010; and (2) how the Fed's inflation target affects the forecasters' inflation forecasts, asked in the second-quarter survey of 2012.

The responses to the 2012 question about inflation targeting were particularly timely (and informative) because the question closely followed the Board of Governors' January 25, 2012, press release stating that the Federal Open Market Committee (FOMC) had reached broad agreement on some principles regarding its longer-run goals and monetary policy strategy: "The Committee judges that inflation at the rate of 2 percent, as measured by the annual change in the price index for personal consumption expenditures, is most consistent over the longer run with the Federal Reserve's statutory mandate." Almost three-fourths of the SPF panelists indicated that their long-run inflation forecasts did not differ in an economically meaningful way from the FOMC's goal of 2 percent. However, eight panelists indicated that they did not believe the FOMC would achieve its goal and wrote down long-run inflation forecasts in excess of 2 percent.

## Value of the SPF

The SPF has a large audience, as judged by statistics on how often the survey results are viewed on the Federal Reserve Bank of Philadelphia's website. In 2018, the survey generated more than 45,000 unique hits to the Philadelphia Fed's external webpages. The audience consists of academic researchers who use the SPF data to measure people's expectations about the future movements of economic variables, policymakers (such as those in government or at the Federal Reserve Board) whose policy choices depend on what people expect to happen in the future, and businesspeople whose plans depend on how they think the economy is likely to evolve. Former Federal Reserve Governor Daniel K. Tarullo put it best in his February 12, 2010, testimony before the U.S. Senate Subcommittee on Security and International Trade and Finance when he said, "The Federal Reserve added questions to the Survey of Professional Forecasters to elicit from private-sector forecasters their subjective probabilities of forecasts of key macroeconomic variables, which provides to us, and to the public, better assessments of the likelihood of severe macroeconomic outcomes."

The survey staff maintains a database of each participant's forecasts in each survey. Each quarterly survey includes a list of the participants in recent surveys, so that readers will know who the participants are. But in the publicly available database of survey results, no forecast is linked to a person's name. This preserves the forecaster's anonymity. Research findings suggest that in surveys in which forecasts are linked to the forecasters' names, some forecasters are much more likely to seek publicity by providing extreme forecasts to stand out from the pack.[1] The SPF has always tried to gather forecasters' true forecasts and prevent any motive for publicity-seeking.

One of the survey's strengths is the documentation provided by the survey staff. Many other surveys of forecasters exist, but they do not match the SPF's level of documentation about the survey's methods and results. A researcher can find the details

**The Anxious Index**

The Anxious Index typically rises during recessions and sometimes even signals a coming recession.

Percent probability of decline in real GDP in the following quarter, surveys conducted in Fourth Quarter 1968 to Third Quarter 2019
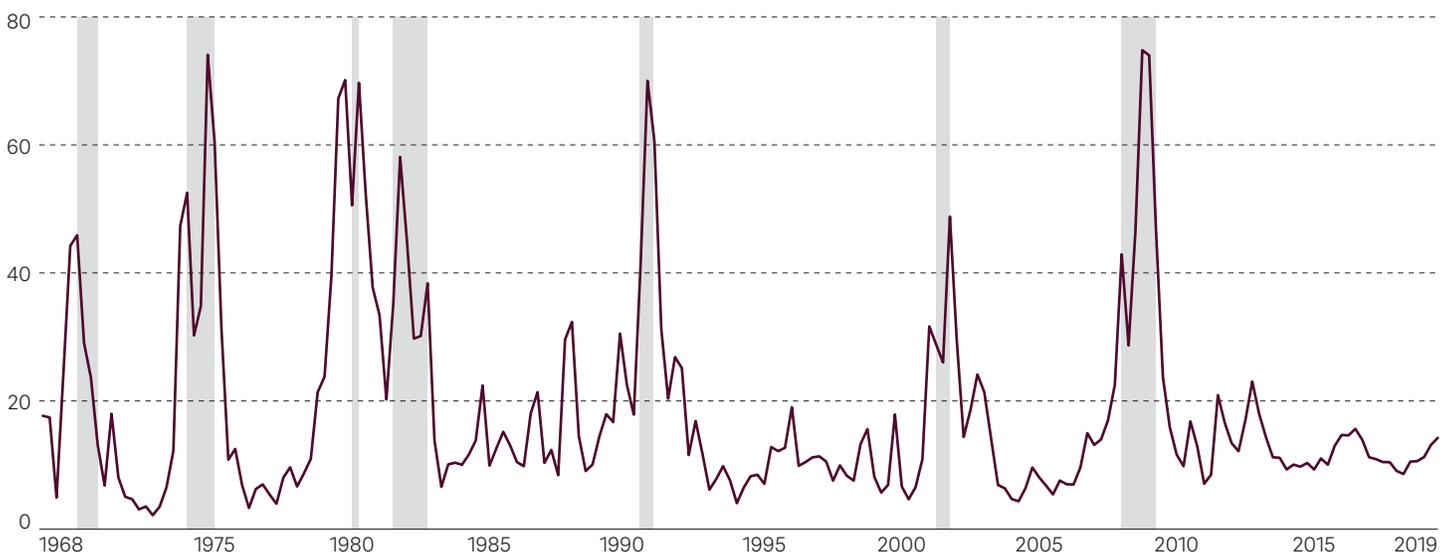

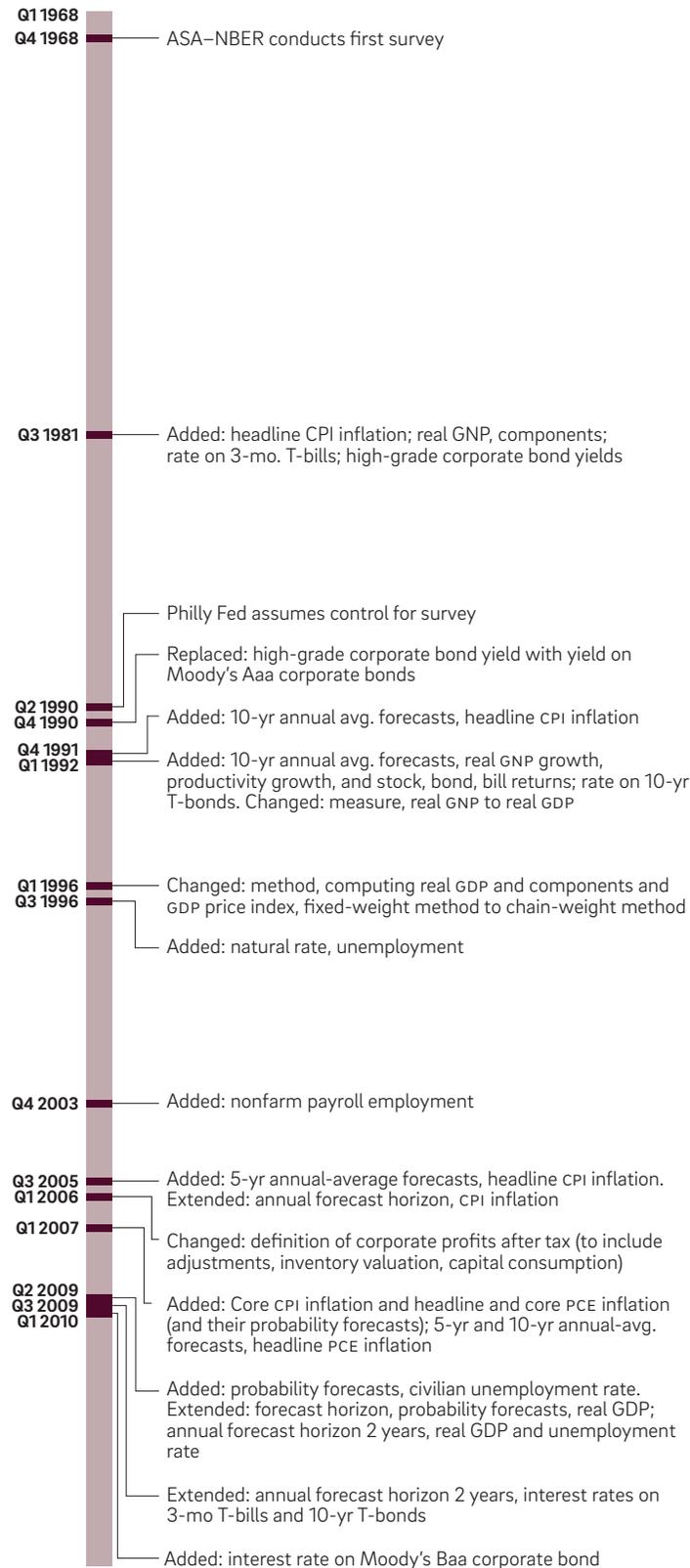
**Note:** Shaded areas indicate recessions.

**Source:** Real-Time Data Research Center, Federal Reserve Bank of Philadelphia.

FIGURE 6

## The SPF's Evolution

As the macro economy changes, so too does the SPF.

Major additions/changes to the survey

| | |
|---|---|
| Q1 1968 | |
| Q4 1968 | ASA–NBER conducts first survey |
| Q3 1981 | Added: headline CPI inflation; real GNP, components; rate on 3-mo. T-bills; high-grade corporate bond yields |
| | Philly Fed assumes control for survey |
| | Replaced: high-grade corporate bond yield with yield on Moody's Aaa corporate bonds |
| Q2 1990 | |
| Q4 1990 | Added: 10-yr annual avg. forecasts, headline CPI inflation |
| Q4 1991 | Added: 10-yr annual avg. forecasts, real GNP growth, productivity growth, and stock, bond, bill returns; rate on 10-yr T-bonds. Changed: measure, real GNP to real GDP |
| Q1 1992 | |
| Q1 1996 | Changed: method, computing real GDP and components and GDP price index, fixed-weight method to chain-weight method |
| Q3 1996 | Added: natural rate, unemployment |
| Q4 2003 | Added: nonfarm payroll employment |
| Q3 2005 | Added: 5-yr annual-average forecasts, headline CPI inflation. |
| Q1 2006 | Extended: annual forecast horizon, CPI inflation |
| Q1 2007 | Changed: definition of corporate profits after tax (to include adjustments, inventory valuation, capital consumption) |
| Q2 2009 | |
| Q3 2009 | Added: Core CPI inflation and headline and core PCE inflation (and their probability forecasts); 5-yr and 10-yr annual-avg. forecasts, headline PCE inflation |
| Q1 2010 | |
| | Added: probability forecasts, civilian unemployment rate. Extended: forecast horizon, probability forecasts, real GDP; annual forecast horizon 2 years, real GDP and unemployment rate |
| | Extended: annual forecast horizon 2 years, interest rates on 3-mo T-bills and 10-yr T-bonds |
| | Added: interest rate on Moody's Baa corporate bond |

of every important aspect of the survey posted on the Philadelphia Fed's website.[2] The documentation makes it easy for a researcher, policymaker, or financial economist to understand exactly what the survey's results are and how to interpret them. It covers all information critical for data users, such as variable definitions and transformations, the survey's timing, and changes to the survey, the last of which should help researchers avoid errors when comparing forecasts from different surveys. The documentation is constantly being updated to reflect new information about the survey as it evolves.
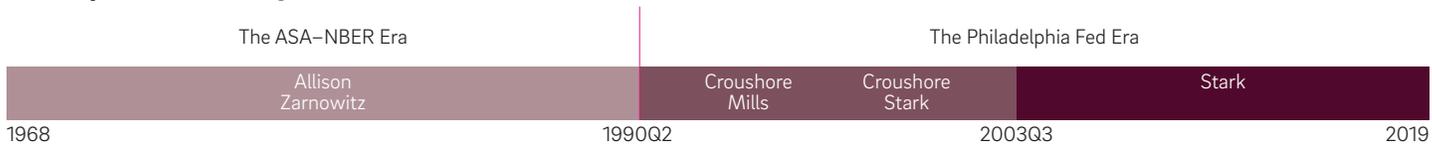
## History of the Survey of Professional Forecasters

Fifty years ago, the American Statistical Association (ASA) and the National Bureau of Economic Research (NBER) joined forces to collect professional forecasts for the U.S. economy. They created a survey to ask forecasters to provide detailed forecasts for numerous economic variables and how those variables would change over time. Victor Zarnowitz of the University of Chicago was instrumental in the history of the survey, writing about the survey's results and studying the accuracy of its forecasts. The survey was administered at NBER. Participants in the survey included the members of the Business and Economic Statistics Section of the ASA, and the survey was called the ASA–NBER Economic Outlook Survey.[3] Notably, the survey was the first of its kind to offer quarterly updates on forecasts for the U.S. economy. The Livingston survey of forecasters, which at the time was being conducted by the *Philadelphia Inquirer* newspaper, came out just twice each year and was much more limited in scope.[4] Zarnowitz promoted the ASA–NBER Economic Outlook survey by writing news releases published in various NBER outlets, including the *NBER Reporter*, which was distributed widely to economists, and the *American Statistician*, which was distributed to statisticians. Zarnowitz also wrote a series of academic journal articles to demonstrate the use of the survey in research.[5]

The ASA–NBER Economic Outlook survey began in the fourth quarter of 1968 and survived until the first quarter of 1990. By then, interest by the sponsoring organizations had declined, Zarnowitz had retired from academia, and the survey folded. Dean Croushore (coauthor of this article), who was then working at the Philadelphia Fed, had just used the survey in a research project and recognized its value. He contacted Zarnowitz and Herb Allison, who was the NBER's point person for the survey. Both were delighted to have the Philadelphia Fed take over responsibility for the survey. Croushore teamed up with his colleague Leonard Mills, and the two restarted the survey, filling in the missing survey from the second quarter of 1990 by asking forecasters to send them printed copies of the forecasts they had made at that time. Croushore and Mills renamed the survey the Survey of Professional Forecasters, invited many new forecasters into the survey, and streamlined its production. The most important improvement was to tighten the deadline for forecast submissions. After Mills left the Federal Reserve, Tom Stark (this article's other coauthor) joined the survey team, and, when Croushore left the Fed in 2003, Stark took control of the survey and made numerous further improvements (Figure 7).

**FIGURE 7**

## History of SPF Management

| The ASA–NBER Era | | The Philadelphia Fed Era | | |
|---|---|---|---|---|
| Allison Zarnowitz | | Croushore Mills | Croushore Stark | Stark |
| 1968 | 1990Q2 | | 2003Q3 | 2019 |

The original ASA-NBER survey in 1968 asked forecasters for their quarterly forecasts of 10 different economic variables, probability forecasts for real output and inflation for the current year, and the probability of a decline in real output in the next five quarters.

The variables included in the survey have changed over the years, often in response to developments in the macro economy (Figure 6). A particularly significant change occurred in the third quarter of 1981, when the NBER added forecasts for real GNP and its components. The survey previously included forecasts only for nominal GNP. The 1981 shift to real GNP allowed analysts to better assess the strength of broad economic conditions. The inclusion of the real GNP components allowed analysts to dissect the sources of the strength.[6]

Another round of significant changes occurred in the early 1990s, when the Philadelphia Fed added long-term forecasts for a handful of variables, including inflation, returns on financial assets, and real GDP growth. The long-term forecasts covered the next 10 years and thus represented a substantial lengthening of the survey's horizon compared with the horizon in previous surveys. This longer horizon was a welcome addition to the survey for readers who were using the forecasts in formulating their long-run planning. Figure 8 shows the median forecast across forecasters in the first-quarter surveys from 1992 to 2019 for the average growth rate of real GDP over the next 10 years from the forecast date.

Another key set of changes to the survey was in measures of inflation. An important mission of the Federal Reserve System is to keep the inflation rate low and stable. Over time, the number of different measures of inflation used by macroeconomists has increased, so the survey has adapted to this change. In the initial surveys, the only inflation measure was for the overall output price measure (the GNP deflator in 1968, for example). In the third quarter of 1981, the survey added the better-known Consumer Price Index (CPI). Then, in 2007, the survey added three additional measures of inflation that allowed policymakers and analysts to better see the future trends in inflation.

The most recent significant change to the survey occurred in the aftermath of the Great Recession of 2007 to 2009, when staff added more questions about the unemployment rate and lengthened the annual forecast horizon for some variables to provide more information about the outlook for the labor market.

## How Researchers Use the SPF

The SPF has become the gold standard for evaluating forecasts or comparing forecasting models. Most researchers who seek to model people's expectations use the SPF as their measure. Forecasters attempting to build a better forecasting model will compare their forecasts to the SPF to see if they can beat it. In this section, we describe some of the major research papers that have used the SPF.

In its early days, the survey had not yet amassed enough data to make its results noteworthy. But once the survey had a longer track record, economists began to use it to test rational expectations, examine how people form expectations, develop optimal forecasts, study monetary policy, and determine the motivations of forecasters.

### Rational Expectations

The SPF was developed in the late 1960s and early 1970s, when macroeconomists were working on a new theory of rational expectations, which assumes that people make rational forecasts. Researchers looked at the SPF forecasts and tested them for bias and efficiency. If the forecasts are unbiased, then the forecast errors average to zero over time. If the forecasts are efficient, then the forecasters used all available information to make their forecasts. Unbiasedness and efficiency are consistent with the idea that people have rational expectations. However, a number of early papers found that the SPF's forecasts were either biased or inefficient, or both.

**FIGURE 8**

## Forecasts for Real GDP Growth

Median of forecasts for annualized percent change in real GDP over the next 10 years, first-quarter surveys from 1992 to 2019



**Source:** Real-Time Data Research Center, Federal Reserve Bank of Philadelphia.

## Variables Included in the SPF

and the quarter they were introduced

### Business Indicators

Nominal GDP (formerly Nominal GNP) **4Q1968**

Price Index, GDP (formerly Price Index, Nominal GNP) **4Q1968**

Corporate Profits After Tax **4Q1968**

Civilian Unemployment Rate **4Q1968**

Nonfarm Payroll Employment **4Q2003**

Industrial Production Index **4Q1968**

Housing Starts **4Q1968**

Interest Rate, 3-Month Treasury Bills **3Q1981**

Interest Rate, Moody's Aaa Corporate Bonds **4Q1990**

Interest Rate, Moody's Baa Corporate Bonds **1Q2010**

Interest Rate, 10-Year Treasury Bonds **1Q1992**

### Real GDP and Components (formerly Real GNP and Components)

Real GDP (formerly Real GNP) **3Q1981**[12]

Real Personal Consumption Expenditures **3Q1981**

Real Nonresidential Fixed Investment **3Q1981**

Real Residential Fixed Investment **3Q1981**

Real Federal Government Consumption Expenditures & Gross Investment **3Q1981**

Real State & Local Government Consumption Expenditures & Gross Investment **3Q1981**

Real Change, Private Inventories **3Q1981**

Real Net Exports **3Q1981**

### CPI and PCE Inflation Rates

Headline CPI Inflation Rate **3Q1981**

Core CPI Inflation Rate **1Q2007**

Headline PCE Inflation Rate **1Q2007**

Core PCE Inflation Rate **1Q2007**

### Long-Term Inflation Rates

5-Year Headline CPI Inflation Rate **3Q2005**

5-Year Headline PCE Inflation Rate **1Q2007**

10-Year Headline CPI Inflation Rate **4Q1991**

10-Year Headline PCE Inflation Rate **1Q2007**

### Additional Long-Term Rates

10-Year Average, Real GDP Growth **1Q1992**

10-Year Average, Productivity Growth **1Q1992**

10-Year Average, Return on Stocks **1Q1992**

10-Year Average, 10-Year Treasury Bond Rate **1Q1992**

10-Year Average, 3-Month Treasury Bill **1Q1992**

Natural Rate, Unemployment **3Q1996**

### Probabilities

Ranges, Real GDP Growth **4Q1968**

Ranges, GDP Price Inflation **4Q1968**

Ranges, Core CPI Inflation **1Q2007**

Ranges, Core PCE Inflation **1Q2007**

Ranges, Civilian Unemployment Rate **2Q2009**

Negative Real GDP Growth (Anxious Index) **4Q1968**

### Implied Forecasts

Introduction varies by alternative measure

Yield Spreads

Forward Inflation Rates

Real Interest Rates

The first researcher to use the SPF to contribute to our understanding of rational expectations was Zarnowitz, who in 1985 found that the SPF's inflation forecasts showed some evidence of bias and thus may not have been consistent with the forecasters having rational expectations.

In 1990 Michael Keane and David Runkle challenged Zarnowitz's results. When using real-time data, Keane and Runkle found no evidence for bias or inefficiency in the SPF forecasts and argued that the forecasts of individual forecasters appear rational.

Then, in 1991, Carl Bonham and Douglas Dacy ran a variety of tests for rational expectations on the SPF and other forecasts of inflation. They found that the SPF forecasts were the best they studied and that the forecasts passed certain key tests for rational expectations but not all tests. So, they concluded that the SPF forecasters do not have "strictly" rational forecasts or "strongly" rational forecasts, but only "sufficiently" rational forecasts–not as rational as the rational-expectations theory implies.

In 2001, Bonham and Richard Cohen followed up on Keane and Runkle's work, finding that the forecasters do not have rational expectations.

### How Do People Form Expectations?

In a unique 1987 paper, Zarnowitz and Louis Lambros showed that a rise in SPF panelists' uncertainty about inflation was associated with a decline in their point forecasts for the strength of the economy. Subsequent work on the relationship between forecasters' uncertainty and their point forecasts suggested that forecasters tend to understate uncertainty and that forecasters do not update their estimates of uncertainty as often as they update their point estimates.[7]

In a 2003 paper, Chris Carroll developed a theory about how nonprofessional forecasters–that is, households–form their expectations. Using survey data on households' expectations along with SPF forecasts, Carroll found that households adjust their expectations after they learn about the professionals' forecasts. Carroll called households' expectations "sticky" because they learn what professional forecasters think about the future and update their views accordingly.

The sticky-information idea is also supported by research conducted in 2003 by N. Gregory Mankiw, Ricardo Reis, and Justin Wolfers. Focusing on inflation expectations, they noted that consumers are more uncertain about inflation than are professional forecasters but that the disagreement between the groups moves in similar ways. They also found that the forecasts of both consumers and professionals do not adjust properly to changes in monetary policy or more generally to changes in macroeconomic conditions. The authors then found evidence supporting their sticky-information theory: Because of the high cost of gathering the needed information, people do not update their expectations frequently. Data from the forecast surveys, including the SPF, supports this view.

The sticky-information view suggests that people do not have the information they need to learn about what is happening in the economy. Alternatively the noisy-information theory suggests that people get plenty of information, but it is difficult to interpret the information properly because the information itself is imperfect or "noisy."

In a 2012 paper, Olivier Coibion and Yuriy Gorodnichenko tried to distinguish these two alternative theories using the SPF along with other surveys of people's expectations. They found general support for the noisy-information theory over the sticky-information theory. More generally, in their 2018 survey of the economic research on expectations formation, Coibion, Gorodnichenko, and Rupal Kamdar cited the SPF extensively in arguing for improved models of the expectations-formation process and suggested that simple theories of rational expectations were contradicted by the survey data.

Can a country's central bank change the way people form their expectations? According to Meredith Beechey, Benjamin Johannsen, and Andrew Levin in a 2011 paper, central banks can help people form expectations by setting an explicit inflation target. They compared inflation forecasts in the euro area, which adopted an explicit target for inflation in 2003, to those in the United States, which had not adopted an inflation target at the time they wrote their paper. They found that there is less disagreement between forecasters about long-run inflation forecasts in Europe than in the United States, as measured by the SPF. This result reinforced David Johnson's  2002 finding that countries adopting an explicit inflation target were able to reduce inflation by more than those that did not. Forecasters in inflation-targeting countries also had smaller forecast errors than forecasters in countries that did not target inflation.

### Optimal Forecasting

Researchers who are trying to develop better models for forecasting the economy often use the SPF as a benchmark. If a researcher could build a model that forecasts better than the SPF, they would have made a major breakthrough. But no forecasting model has consistently outperformed the SPF.[8] Although Norman Swanson and Halbert White, in a 1997 paper, showed that a sophisticated artificial neural network forecasting model could outperform the SPF for some variables under certain conditions, the gold standard for comparison is still the SPF, and even Swanson and White's very sophisticated model had trouble meeting that gold standard.

### Studying Monetary Policy

Many researchers have used the SPF to study issues related to monetary policy and how the Federal Reserve operates. In 2000, Christina Romer and David Romer compared the forecasts made by the Federal Reserve staff to forecasts from private-sector forecasters, including the SPF. They showed that Fed staff forecasts of inflation and output are better than SPF forecasts, suggesting that the Fed has an information advantage over other forecasters, owing to the high level of resources that the Fed devotes to economic analysis.[9] One implication of the Romers' analysis is that when the Fed raises or lowers short-term interest rates, it reveals information about future inflation to the market, leading private-sector forecasters to change their forecasts and causing long-term interest rates to change.

Modern macroeconomic theory rests upon many economic relationships of interest to monetary policymakers. Two critical relationships are the Phillips curve, which relates today's inflation rate to the inflation rate expected in the future, and the Taylor rule for guiding the FOMC's decisions on interest rates. Both relationships depend upon expectations for future inflation, among other factors. Recent research on better understanding the Phillips curve and the Taylor rule uses SPF forecasts for inflation as an important component.[10]

### What Motivates Forecasters?

It seems natural to think that forecasters want their projections to be as accurate as possible. They would like their projections to closely follow what actually happens in the economy. Indeed, when economists analyze the accuracy of forecasts, they first compute a forecast error, defined as the difference between the projection and the realization, and they almost always assume that smaller errors are better than larger ones. Often the economists will formally test whether the errors are close to zero on average, a condition they call "unbiased." These economists prefer unbiased forecasts over biased ones.

In an intriguing and thought-provoking 2002 paper, Owen A. Lamont challenged the premise that all forecasters want to produce accurate projections. Some, he argued, might face financial incentives to report inaccurate projections as long as their projections are more extreme than other publicly available projections. One reason for reporting an inaccurate but extreme projection is that a forecaster might be compensated for generating publicity around their extreme projection. As an example, Lamont cited the case of what he described as a "well-known recession-caller," a prominent professional forecaster who continually predicted recessions throughout the 1980s. Lamont tested his theory using projections from the *Business Week* survey and found evidence supporting his hypothesis. He concluded that forecasters in the *Business Week* survey do not always report projections formulated to achieve accuracy. Lamont's findings could spell trouble for forecast surveys like the SPF. If the SPF projections reflect the type of strategic behavior found by Lamont in the *Business Week* survey,  people who rely upon the SPF forecasts will make incorrect decisions.

In 1997, Stark, after reading an earlier 1995 version of Lamont's paper, replicated Lamont's empirical methodology on the SPF

panel of forecasters. He found no evidence to support Lamont's theory in the SPF projections. Taken at face value, Lamont's and Stark's results suggest that the panelists in the SPF and those in the *Business Week* survey faced different incentives in reporting their projections. Evidently, Lamont's forecasters faced an incentive to report distorted projections while Stark's forecasters did not.

Lamont's work nevertheless stands out as an important reminder that users of forecast surveys like the SPF should not necessarily assume the panelists are reporting their best, most accurate projections. Moreover, Lamont's path-breaking idea has had a profound effect on how we have conducted the SPF over the years. The SPF has always been an anonymous survey; we never publish a panelist's name with their projection. In principle, this policy removes the potential for a publicity motive affecting the projections. Over the years, we have faced some pressure from academics and other data users to release the names of the forecasters with their projections. We have fought hard against these requests because of our concerns about how the forecasts might be affected. The bedrock for our strong position has always been Lamont's work.

## Real-Time SPF Forecasts, Real-Time Historical Data, and Forecast Accuracy

Like other forecast surveys, the SPF is in real time. That means the panelists submit their projections using only the information on the economy available to them at the time they make their computations. The survey's projections cannot, of

course, reflect economic information not yet available.

Less obvious is that forecasters also cannot know about revisions to the historical data not yet made. It is a well-known feature of most, but not all, macroeconomic data that the U.S. government statistical agencies that produce and disseminate them frequently revise their historical data estimates. The BEA, for example, produces its first estimate of the quarterly data point at the end of the first month of the following quarter but revises that estimate at the end of the second and third months. Annual revisions occurring each July affect the past few years of historical observations, and comprehen-

sive revisions (about every five years) can affect the quarterly historical data values as far back as 1947.

Any scientific study of the accuracy of a real-time forecast survey like the SPF should incorporate the real-time characteristics of the underlying historical data on which the survey's projections rest. Stark undertook such a study in 2010 using historical data from the Philadelphia Fed's Real-Time Data Set for Macroeconomists (RTDSM) and the forecast data from the SPF. Stark used the RTDSM to replicate the exact data environment the SPF panelists confronted when they submitted their projections. Using this data set, he estimated a simple time series model and

## Who Are the Forecasters?

When we use the term professional forecaster, we mean a person for whom forecasting is a major component of their job. Some panelists work at forecasting firms, providing forecasts for their external clients. Others work at banks or other financial institutions and generate forecasts for their internal and external clients. The panel also includes some chief economists for industry trade groups and manufacturers. A few academics who study optimal forecast methods round out the panel. The forecasters use various methods to produce their forecasts. In a special 2009 survey conducted by the survey staff, most of the forecasters reported using a quantitative model to produce their forecasts but modified the projections to reflect the current state of the economy and recent trends.[13] The major finding of the 2009 survey was that nearly all of the forecasters supplemented their models with their subjective beliefs about the economy. In addition, the 2009 survey found that the forecasters used different methods for different forecast horizons. For example, their model for a forecast of real GDP in the current quarter may be very different from the model they use for the average real GDP growth rate over the next five years.

In early surveys, we did not list the names of the participants even though we published each forecaster's individual projections, identified only by a confidential ID number. After receiving suggestions from several panelists, we began to publish a list of participants along with their professional affiliations, but never next to their projections. We believe strongly in the benefits of keeping the survey results anonymous.

used that model to generate comparison–or benchmark–forecasts against which to judge the relative accuracy of the survey's forecasts. The use of real-time data for this purpose imposes fairness (and scientific integrity) on the comparison between the accuracy of the benchmark projections and the real-time SPF projections. In other words, both sets of projections are in real time and use the same historical data, making the competition fair. Stark also used the RTDSM to choose alternative measures of the realizations (depending on the degree to which the realizations were revised) against which each set of projections, SPF and benchmark, were to be judged for accuracy. The study measured not only how accurate the SPF forecasts were compared with the benchmark forecasts but also how sensitive the comparison was to revisions in the historical data.

Following standard academic research methods, Stark's findings show that revisions to historical data can have large effects on measured forecast accuracy but little effect on relative forecast accuracy between the SPF and benchmark. A common finding across almost all variables was that the SPF projection was more accurate than the benchmark projection at shorter forecast horizons and equally accurate at the longer horizons. Since Stark's original study, the staff of the real-time data center has updated Stark's original analysis following each quarterly survey.[11] Notably, Stark's 2010 findings continue to hold more recently.

## Concluding Comments

The Philadelphia Fed's Survey of Professional Forecasters reached its 50th anniversary with the publication of the fourth-quarter 2018 results. Started by the NBER and the ASA in 1968, the survey has evolved quite a bit over the last 50 years, especially with the Philadelphia Fed's involvement beginning in 1990. Most prominently, the long historical record of the survey's private-sector forecasts has encouraged an enormous amount of published economic research on topics of prime interest to policymakers and has contributed significantly to a deeper understanding of such topics as optimal forecasting methods, the formation of macroeconomic expectations, the real-time evaluation of forecast accuracy, and the importance of data revisions for forecasting. The Philadelphia Fed is proud to have played such a significant role in fostering research in these areas and looks forward to another 50 years of the Survey of Professional Forecasters. 🖹

## Notes

**1** See Laster, Bennett, and Geoum (1999) and Lamont (2002).

**2** See https://www.philadelphiafed.org/-/media/research-and-data/real-time-center/survey-of-professional-forecasters/spf-documentation.pdf?la=en.

**3** See Zarnowitz (1968) for details.

**4** The Philadelphia Fed now runs the Livingston survey as well.

**5** See this article's References for his papers about the survey.

**6** The Philadelphia Fed's data files include forecasts for real output in surveys before that of the third quarter of 1981 because we computed them as nominal GNP divided by the GNP deflator, two variables that have always been in the survey.

**7** For more details, see Giordani and Söderlind (2003), Rich and Tracy (2010), and Clements (2010).

**8** See Ang, Bekaert, and Wei (2007).

**9** Even though the Romers showed that the Fed's forecasts are superior to those of the SPF, Carlos Capistrán showed in a 2008 paper that the SPF forecasts contain some useful information absent from the Fed's staff forecasts.

**10** For examples, see Taylor (1993), Orphanides (2003), Orphanides and Williams (2002, 2007).

**11** See www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/data-files/error-statistics.

**12** Real GNP first entered the survey as a distinct variable in the third quarter of 1981. In prior surveys, real GNP projections were computed as the ratio of the projection for nominal GNP to the projection for the GNP price index.

**13** See Stark (2013) for details.

# References

Ang, Andrew, Geert Bekaert, and Min Wei. "Do Macro Variables, Asset Markets, or Surveys Forecast Inflation Better?" *Journal of Monetary Economics*, 54:4 (2007), pp. 1163–1212, https://doi.org/10.1016/j.jmoneco.2006.04.006.

Beechey, Meredith J., Benjamin K. Johannsen, and Andrew T. Levin. "Are Long-Run Inflation Expectations Anchored More Firmly in the Euro Area Than in the United States?" *American Economic Journal: Macroeconomics*, 3:2 (2011), pp. 104-129, https://doi.org/10.1257/mac.3.2.104.

Bonham, Carl S., and Richard H. Cohen. "To Aggregate, Pool, or Neither: Testing the Rational Expectations Hypothesis Using Survey Data," *Journal of Business & Economic Statistics*, 19:3 (2001), pp. 278–291, https://doi.org/10.1198/073500101681019936.

Bonham, Carl, and Douglas C. Dacy. "In Search of a Strictly Rational Forecast," *Review of Economics and Statistics*, 73:2 (1991), pp. 245–253.

Capistrán, Carlos. "Bias in Federal Reserve Inflation Forecasts: Is the Federal Reserve Irrational or Just Cautious?" *Journal of Monetary Economics*, 55:8 (2008), pp. 1415–1427, https://doi.org/10.1016/j.jmoneco.2008.09.011.

Carroll, Christopher D. "Macroeconomic Expectations of Households and Professional Forecasters," *Quarterly Journal of Economics*, 118:1 (2003), pp. 269–298, https://doi.org/10.1162/00335530360535207.

Clements, Michael P. "Explanations of the Inconsistencies in Survey Respondents' Forecasts," *European Economic Review*, 54:4 (2010), pp. 536–549, https://doi.org/10.1016/j.euroecorev.2009.10.003.

Coibion, Olivier, and Yuriy Gorodnichenko. "What Can Survey Forecasts Tell Us About Informational Rigidities?" *Journal of Political Economy*, 120:1 (2012), pp. 116–159, https://doi.org/10.1086/665662.

Coibion, Olivier, Yuriy Gorodnichenko, and Rupal Kamdar. "The Formation of Expectations, Inflation, and the Phillips Curve," *Journal of Economic Literature*, 56:4 (2018), pp. 1447–1491, https://doi.org/10.1257/jel.20171300.

Giordani, Paolo, and Paul Söderlind. "Inflation Forecast Uncertainty," *European Economic Review*, 47:6 (2003), pp. 1037–1059, https://doi.org/10.1016/S0014-2921(02)00236-2.

Johnson, David R. "The Effect of Inflation Targeting on the Behavior of Expected Inflation: Evidence from an 11 Country Panel," *Journal of Monetary Economics*, 49:8 (2002), pp. 1521–1538, https://doi.org/10.1016/S0304-3932(02)00181-2.

Keane, Michael P., and David E. Runkle. "Testing the Rationality of Price Forecasts: New Evidence from Panel Data," *American Economic Review*, 80:4 (1990), pp. 714–735.

Lamont, Owen A. "Macroeconomic Forecasts and Microeconomic Forecasters," National Bureau of Economic Research Working Paper 5284 (October 1995).

Lamont, Owen A. "Macroeconomic Forecasts and Microeconomic Forecasters," *Journal of Economic Behavior & Organization*, 48:3 (2002), pp. 265–280, https://doi.org/10.1016/S0167-2681(01)00219-0.

Laster, David, Paul Bennett, and In Sun Geoum. "Rational Bias in Macroeconomic Forecasts," *Quarterly Journal of Economics*, 114:1 (1999), pp. 293–318, https://doi.org/10.1162/003355399555918.

Leonhardt, David. "Economic View: Forecast Too Sunny? Try the Anxious Index," *New York Times*, September 1, 2002.

Mankiw, N. Gregory, Ricardo Reis, and Justin Wolfers. "Disagreement About Inflation Expectations," *NBER Macroeconomics Annual*, 18 (2003), pp. 209–248, https://doi.org/10.1086/ma.18.3585256.

Orphanides, Athanasios. "Historical Monetary Policy Analysis and the Taylor Rule," *Journal of Monetary Economics*, 50:5 (2003), pp. 983–1022, https://doi.org/10.1016/S0304-3932(03)00065-5.

Orphanides, Athanasios, and John C. Williams. "Robust Monetary Policy Rules with Unknown Natural Rates," *Brookings Papers on Economic Activity*, 2 (2002), pp. 63–145, https://doi.org/10.1353/eca.2003.0007.

Orphanides, Athanasios, and John C. Williams. "Robust Monetary Policy with Imperfect Knowledge," *Journal of Monetary Economics*, 54:5 (2007), pp. 1406–1435, https://doi.org/10.1016/j.jmoneco.2007.06.005.

Rich, Robert, and Joseph Tracy. "The Relationships Among Expected Inflation, Disagreement, and Uncertainty: Evidence from Matched Point and Density Forecasts," *Review of Economics and Statistics*, 92:1 (2010), 200–207, https://doi.org/10.1162/rest.2009.11167.

Romer, Christina D., and David H. Romer. "Federal Reserve Information and the Behavior of Interest Rates," *American Economic Review*, 90:3 (2000), pp. 429–457, https://doi.org/10.1257/aer.90.3.429.

Stark, Tom. "Macroeconomic Forecasts and Microeconomic Forecasters in the *Survey of Professional Forecasters*," Federal Reserve Bank of Philadelphia Working Paper 97–10 (1997), https://www.philadelphiafed.org/-/media/research-and-data/publications/working-papers/1997/wp97-10.pdf?la=en.

Stark, Tom. "Realistic Evaluation of Real-Time Forecasts in the Survey of Professional Forecasters," Federal Reserve Bank of Philadelphia *Research Rap Special Report*, May 2010, https://www.philadelphiafed.org/-/media/research-and-data/publications/research-rap/2010/realistic-evaluation-of-real-time-forecasts.pdf?la=en.

Stark, Tom. "SPF Panelists' Forecasting Methods: A Note on the Aggregate Results of a November 2009 Special Survey" (March 2013), https://www.philadelphiafed.org/-/media/research-and-data/real-time-center/survey-of-professional-forecasters/spf-special-survey-on-forecast-methods.pdf?la=en.

Swanson, Norman R., and Halbert White. "A Model Selection Approach to Real-Time Macroeconomic Forecasting Using Linear Models and Artificial Neural Networks," *Review of Economics and Statistics*, 79:4 (1997), pp. 540–550, https://doi.org/10.1162/003465397557123.

Taylor, John B. "Discretion Versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy*, 39 (1993), pp. 195–214.

Zarnowitz, Victor. "The New ASA-NBER Survey of Forecasts by Economic Statisticians." A Supplement to National Bureau Report 4, National Bureau of Economic Research, December 1968, pp. 1–8.

Zarnowitz, Victor. "An Analysis of Annual and Multiperiod Quarterly Forecasts of Aggregate Income, Output, and the Price Level," *Journal of Business*, 52:1 (1979), pp. 1–33, https://www.jstor.org/stable/2352661.

Zarnowitz, Victor. "Rational Expectations and Macroeconomic Forecasts," *Journal of Business and Economic Statistics*, 3:4 (1985), pp. 293–311.

Zarnowitz, Victor, and Phillip Braun. "Twenty-Two Years of the NBER-ASA Quarterly Economic Outlook Surveys: Aspects and Comparisons of Forecasting Performance," in James H. Stock and Mark W. Watson, eds., *Business Cycles, Indicators, and Forecasting*. Chicago: University of Chicago Press, 1993, pp. 11–94.

Zarnowitz, Victor, and Louis A. Lambros. "Consensus and Uncertainty in Economic Prediction," *Journal of Political Economy*, 95:3 (1987), pp. 591–621, https://doi.org/10.1086/261473.