

# The Livingston Survey: Still Useful After All These Years

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**T**he decisions of households, firms, and government agencies depend on forecasts of the overall economy. Households face decisions such as whether to refinance a mortgage, whether to buy or lease a car, how to invest their savings, how to plan for retirement, and how to save for their children's college education, all of which depend on the future movements of macroeconomic variables like interest rates, output, the stock market, and inflation. Those same macroeconomic variables influence the

decisions of business firms about what equipment to buy, how to market a product, how to invest excess funds, and how to borrow to meet liquidity needs. Government policymakers need good forecasts to calculate the costs and benefits of spending programs and to estimate tax revenues.

Households, firms, and governments can get macroeconomic forecasts in many different ways. Large firms and the federal government may have the resources to hire their own economists to provide forecasts. Some organizations may hire a consulting firm to forecast for them. But for smaller firms, households, and local governments, for which such an expense

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wouldn't be worthwhile, are there any alternatives?

One alternative is to subscribe to a survey of forecasters, such as the Livingston Survey, which, after 50 years, still provides useful forecasts of the economy.

### THE SURVEY'S HISTORY

In 1946, Joseph A. Livingston, then a columnist for the *Philadelphia Record*, began asking business economists he knew to provide him with their forecasts for important economic variables. He followed through with the survey every six months, in June and December, even when he moved from the *Record* to the *Bulletin* in 1948 and to the *Philadelphia Inquirer* in 1972. Livingston wrote a lively (at least by economists' standards!) column about the results, and his survey gained a national following.

The survey had been around for a long time before economists discovered its value in the 1970s. The rise of inflation in that decade led to the formulation of a new economic theory known as rational expectations. The theory suggests that people who forecast will use all available, relevant information. Doing so implies that their forecasts won't be systematically biased (that is, forecast errors will be random and won't have any obvious pattern to them). As economists began seeking ways to test the rational expectations theory, they turned to the Livingston Survey, which was the only good collection of forecasts of macroeconomic variables.

Livingston received many requests from economists for his survey data — so many that, in 1978, he turned to the Federal Reserve Bank of Philadelphia for help. The Philadelphia Fed entered the survey data into a computer database and made the data available to researchers in an organized fashion.

In 1985, the Philadelphia Fed and Livingston, acknowledging the value of continuing the survey perpetually, agreed that if Livingston no

longer wanted to continue the survey, or was unable to do so, the Fed would take over. So when Livingston died in 1989, the Philadelphia Fed took over the survey.

In a 1992 issue of this *Business Review*, Herb Taylor provided a more complete history of the survey and how Livingston wrote about it. This article will focus more on the details of the survey and its value in research.

### HOW THE SURVEY WORKS

Every June and December, the Livingston Survey asks participants to forecast a set of key macroeconomic variables, including real and nominal GDP (gross domestic product, which is the best overall measure of our economy's total production), inflation (both the producer price index and the consumer price index), the unemployment rate, the three-month Treasury-bill interest rate, the interest rate on 30-year Treasury bonds, and the S&P 500 stock index. In addition, the survey covers a variety of other variables: real nonresidential fixed investment, corporate profits after taxes, industrial production, total private housing starts, average weekly earnings in manufacturing, retail trade, auto sales, and the prime interest rate.

Survey participants are asked to provide forecasts for these variables for the end of the current month, six months ahead, and 12 months ahead. They also provide forecasts for the current calendar year, the following calendar year, and (in the December survey only) the calendar year after next. In 1991, the survey added a new question, which asked for 10-year forecasts for real GDP and consumer price inflation.

The timing of the survey is crucial, since the information available to forecasters affects what their forecasts will be. Because of the importance of forecasts of consumer price inflation, the survey is mailed to participants in May and November, immediately following the government's release of the consumer price index (CPI) for the preceding month. The Fed re-

quests that the survey be returned before the next release of the CPI in June and December.

Who are the forecasters? Because of his work as a journalist, Livingston was well known in the business economics community. He polled economists with whom he had discussed issues for stories he was writing, including many economists on Wall Street, in corporations, and at forecasting firms, as well as private consultants. He also developed contacts with economists in academia who were interested in macroeconomic forecasting. The Philadelphia Fed continues the tradition of seeking a wide variety of participants. Currently, about 30 percent of the forecasters come from nonfinancial businesses (for example, a number are chief economists of corporations), 29 percent are from investment banking firms (many on Wall Street), 20 percent represent commercial banks around the country, 13 percent work in academic institutions, and the remaining 8 percent come from labor organizations, government, and insurance companies.

The number of participants in the survey has been fairly steady over time, averaging about 50 forecasters in each survey. Currently, about 90 participants are on the mailing list, and 55 to 65 return the survey each time.

An important issue in surveys like the Livingston is how to get people to provide their true forecasts. After all, the participants aren't paid; their only reward is that they receive the survey on a regular basis and see their name on the list of participants. However, the survey does not reveal which individual made which forecasts. If it did, some participants might shade their forecasts more toward the consen-

sus (to avoid unfavorable publicity when wrong), while others might make unusually bold forecasts, hoping to stand out from the crowd. To prevent these publicity effects, the survey provides a list of the participants but doesn't tell who provided which forecast.

The results of the Livingston Survey are released to the press near the end of June and December each year. Staff members in the Research and Statistics Department at the Philadelphia Fed prepare a press release and tables of the survey results, which are released on a public-relations news service. Stories about the survey appear in many major newspapers and on Wall Street newswires. Staff members also report the results in

on-camera or telephone interviews. The results are also made available via the Internet on the Philadelphia Fed's Web page (<http://www.phil.frb.org>).

#### **IMPORTANCE OF THE LIVINGSTON SURVEY IN ECONOMIC RESEARCH**

The Livingston Survey would not have survived the past 50 years had it not been of value to someone. Joseph Livingston used it as the basis for two newspaper columns each year. But its more enduring legacy is the research done by academic economists, who have used and tested the survey forecasts in many different ways to examine hypotheses about expectations. (For a synopsis of current research on expectations in economics presented at a recent conference, see *Conference on Expectations in Economics: In Honor of the 50th Anniversary of the Livingston Survey*.)

The first question one might ask is: how good

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## CONFERENCE ON EXPECTATIONS IN ECONOMICS: In Honor of the 50th Anniversary of the Livingston Survey

The Federal Reserve Bank of Philadelphia and the University of Pennsylvania jointly sponsored a conference in October 1996 on "Expectations in Economics: In Honor of the 50th Anniversary of the Livingston Survey." Seven new papers showed that research about expectations is still active and making new discoveries.

Robert Shiller of Yale University presented "Why Do People Dislike Inflation?" In the paper, Shiller reports the results of a survey that asks people what it is about inflation that causes problems for them, and how they rank inflation's importance compared with other problems they face. Shiller compares the results of surveys taken in the United States to those taken in Germany and Brazil.

Charles Manski of the University of Wisconsin presented his joint work with Jeff Dominitz, "Perceptions of Economic Insecurity: Evidence from the Survey of Economic Expectations." The authors report the results of a new survey that asks people about their susceptibility to the loss of health insurance, burglary, and job loss. They compare people's perceptions of the likelihood of these events to data on how often the events actually occur and find that people perceive their risk of loss due to crime to be much higher than it really is.

Gary Ramey of the University of California at San Diego discussed his joint work with George Evans, "Calculation, Adaptation, and Rational Expectations." The paper shows how intensely people calculate things based on their estimates of benefits compared with costs. It may not be worthwhile for people to spend time and effort gathering all the information possible before reaching a decision. The authors use numerical illustrations to demonstrate the theoretical work.

Stephen McNees, an economic consultant formerly at the Federal Reserve Bank of Boston, tests probability forecasts from the Survey of Professional Forecasters in his paper "Forecast Uncertainty: Can It Be Measured?" McNees examines whether the probabilities reported by the survey participants are accurate. If the participants say there's an 80 percent chance that real GDP will grow between 1 and 3 percent over the next year, does real GDP actually fall into that range 80 percent of the time? McNees finds that, on average, the probabilities are accurate, though not for all the participants in the survey.

In their paper "Measuring Predictability: Theory and Macroeconomic Applications," Lutz Kilian of the University of Michigan and Frank Diebold of the University of Pennsylvania reported on the predictability of different macroeconomic variables. The paper begins by creating a general measure of a variable's predictability. The authors show how to estimate predictability from sample time-series data and apply it to U.S. data.

Carl Bonham of the University of Hawaii presented his work (with Richard Cohen) "Heterogeneous Expectations: Aggregation Bias and the Poolability of Survey Forecasts in Tests of the Rational Expectations Hypothesis." The paper makes clear the relationship between forecasts made by individuals and the average across those forecasts in tests of rational expectations. They examine forecasts from the Survey of Professional Forecasters.

Owen Lamont from the University of Chicago asserts that older economists make bolder forecasts. In his paper "Macroeconomic Forecasts and Microeconomic Forecasters," he studies forecasts from *Business Week* and shows that economists attempt to position their forecasts to manipulate beliefs about the economists' ability. As economists become older and more established, they produce more radical forecasts, which are less accurate.

These papers show that economists are actively engaged in research on expectations. Surveys like the Livingston Survey continue to provide useful data for testing economic theories.

Copies can be obtained by writing to the authors of the papers.

are the Livingston forecasts? If a household, firm, or government based its planning on the survey, how would it make out? As we'll see, these questions have been answered in different ways as the survey has been tested in research. But it's best to begin by looking at what economists were thinking when they first began to investigate the survey.

In the 1960s and 1970s, macroeconomics was dominated by the theories of John Maynard Keynes. Keynesians said that rigid prices and wages were important aspects of the macroeconomy. Adverse shocks to the economy could lead to recessions because prices and wages would not adjust immediately. The theory implied that the government could eliminate business cycles by using appropriate fiscal and monetary policies. The Keynesian models of the era were based on adaptive expectations — they assumed that people's expectations of future inflation were just projections of past inflation.

In contrast, rational expectations theory suggested that people would use all the information available to them in forming forecasts. The idea of rational expectations originated with John F. Muth in 1961, but the theory took off in the second half of the 1970s with the publication of key papers by Robert Lucas, by Lucas and Thomas Sargent, and by Sargent and Neil Wallace.

Rational expectations theory showed how the Keynesian models were flawed by their failure to deal adequately with expectations. According to this theory, people can make better forecasts by using more information. For example, if people observe the money supply increasing more rapidly than before, they'll increase their forecasts of inflation because they know that faster money growth leads to higher inflation.

The theory of rational expectations was important because it provided a reasonable explanation of the failure of the Phillips curve in the 1970s. The Phillips curve showed a tradeoff

between inflation and unemployment that Keynesian economists believed to be stable. If inflation rose, unemployment would fall, and vice versa. In the mid-1970s, a deep recession was accompanied by rising inflation — an impossibility according to the Phillips curve model. Rational expectations theory showed how inflation and unemployment could rise together when people began to expect higher rates of inflation.

The theory of rational expectations doesn't say that everybody should be a great forecaster — only people whose forecasts matter to their livelihoods. An engineer doesn't spend much time forecasting inflation because her job doesn't depend on it. But a Wall Street money manager may spend a lot of time and energy forecasting inflation because the returns on her portfolio depend a lot on what happens to inflation. So the money manager will spend a lot more time trying to understand the economy and reading through the details of economic reports than will the engineer.

**How Can the Theory of Rational Expectations Be Tested?** How do we know if people are forming their expectations rationally? One way is to look at people's forecasts and see if they're any good. But what constitutes a good forecast? That question has been answered in a number of different ways using the Livingston Survey.

If people have rational expectations, they shouldn't make systematic errors in producing their forecasts. If their errors had a recognizable pattern, the forecasters would modify their methods.

There are two obvious ways in which people could make systematic errors. One is that, over long periods of time, their forecast errors might not average out to zero. But if so, the forecast errors could be reduced by subtracting out the average error from the forecasts. This idea suggests some straightforward tests for the quality of forecasts. A simple test is to calculate the average forecast error and see if it's close to zero.

A more sophisticated test is to plot the actual value of the variable against the forecast. If the forecast is unbiased, the plot should be centered on a 45-degree line through the origin. That would mean that, on average, the forecasts were randomly distributed around the actual values. One can also use the statistical tool of econometrics to investigate how close those points are to the 45-degree line. Using linear regression analysis, an analyst can see if the best-fitting line through the plot of the actual values against the forecasts is significantly different from the 45-degree line. If it is, the forecasts are said to be biased; if not, the forecasts are unbiased.

Forecasters make a second type of systematic error: they fail to use all available information when forming their forecasts. If forecasters ignore some relevant piece of data, their forecast errors will be systematically related to that data. An econometric test examines whether the forecast errors are related to data that forecasters had available. If there's no such relationship, the forecasts are said to be efficient. If there is a statistically significant relationship, the forecasts are inefficient. For more technical details on these tests, see the Appendix.

**Early Tests of Rational Expectations of Inflation.** Inflation is the most important macroeconomic variable for testing rational expectations because Lucas and Sargent suggested that errors in forming expectations of inflation are the key to understanding the business cycle.

The first article to analyze the Livingston Survey's inflation forecasts was written in 1970 by Stephen Turnovsky. Ahead of his time, Turnovsky performed the first bias tests on the Livingston Survey data. Looking at data from 1954 to 1969, he found that inflation forecast errors were large in the late 1950s, but much smaller in the 1960s. When Turnovsky ran the econometric tests for bias (described in the Appendix), he found that, on average, inflation was forecast about 1 percentage point too low from 1954 to 1964. But he found no bias from

1962 to 1969. He suggested that something changed around 1960 to improve the inflation forecasts. Perhaps people didn't have much incentive to forecast inflation well before then, since inflation was low on average.

In a 1975 article, James Pesando evaluated the Livingston forecasts and found them to be biased in a certain way. Pesando used the data from 1959 to 1969 and showed that the 12-month-ahead forecasts weren't consistent with the six-month-ahead forecasts. When he ran bias tests as Turnovsky did, he found the six-month-ahead forecasts weren't biased, but the 12-month-ahead forecasts were. Pesando was the first person to suggest that perhaps the Livingston Survey wasn't representative of people's true forecasts. If the survey did represent true forecasts, people weren't rational, according to his statistical tests. And that's hard to believe because people would lose money in financial markets if they weren't rational.

It turned out that both Turnovsky and Pesando had used the Livingston Survey results as Livingston had published them in his newspaper column. But John Carlson of Purdue University found two serious problems with the data, as he reported in his 1977 study. First, Livingston didn't report the data quite as his respondents sent them in. In particular, if revised data came in between the time at which people made their forecast and when his column was published, Livingston modified the forecasts he reported. This was a pragmatic way for a journalist to deal with the problem of revised data, but it caused many problems for economists. So Carlson was able to get the original data from Livingston and handle it properly for statistical testing.

Carlson also pointed out that although people were treating the forecasts as covering six-month and 12-month periods, that wasn't accurate. For example, when the questionnaires were mailed out for the December survey, respondents knew only the October consumer price index (most of the time). But they were

asked to forecast the index for the following June and December, so their forecasts were really for eight months (October to June) and 14 months (October to the following December).

This methodological flaw in the survey created problems for researchers, especially since, at times, some forecasters knew only the October index when they made their forecasts, while others knew the November index. Prior to 1969, the CPI was released even later, so the forecasters may have had even less information when sending in their forecasts. This makes testing for rational expectations tricky. The flaw was finally corrected in 1992 after the Philadelphia Fed had run the survey for several years. The solution was simple: ask forecasters to forecast the current December value for the index (as well as June and the following December), so that there are definite six- and 12-month forecasts. Also, the timing of the survey was tightened to ensure that all responses to the survey were received before the CPI for May or November was released; this ensured that, for consumer price inflation at least, all forecasters had the same data.

When Carlson used corrected data and reran Pesando's tests, he found that the inflation forecasts were even worse. But Pesando's procedure had made a very strong assumption about how inflation behaved over time.<sup>1</sup> Carlson allowed the inflation process to change over time and compared a statistical forecast with the Livingston Survey forecasts. He found that the survey forecasts were generally better than the statistical forecasts. While this fact underlines the value of the survey, Carlson also noted the very large forecast errors in the early 1970s, a time when inflation rose to much higher levels than anticipated.

**Key Rationality Tests.** The next important

paper in this literature came in 1978 from Don Mullineaux, then at the Philadelphia Fed. Mullineaux argued that Pesando's test (the one replicated by Carlson using the corrected data) was statistically flawed. He tried a closely related (but statistically correct) test and found no irrationality in the Livingston Survey forecasts.

Mullineaux's results in support of the survey's forecasts were almost immediately challenged by Douglas Pearce in 1979, who, using a different methodology, found that inflation forecasts were biased. Pesando, Carlson, and Mullineaux all assumed that inflation followed a particular statistical process. But a look at the data suggests that inflation follows a very different process.<sup>2</sup> And when Pearce generated statistical forecasts using this alternative process, they were much better than the Livingston Survey forecasts. Thus, the Livingston forecasts weren't efficient because they didn't use information on past inflation to form better forecasts. Pearce struck a strong blow against the accuracy of the Livingston Survey forecasts of inflation.

Some of the issues in the literature on rational expectations are fairly technical and thus impossible to discuss in a survey article like this one. But one technical issue turns out to be vitally important in carrying out the tests described above. Economists call it the problem of overlapping observations. Suppose in June and December 1994 you made forecasts for the next year. That is, in June 1994 you made a prediction for the consumer price index from June 1994 to June 1995, and in December 1994 you made a forecast from December 1994 to December 1995. Notice that the time periods of the two

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<sup>1</sup>Pesando assumed that inflation was related to past inflation in a fixed pattern for the preceding five periods (each period is a half year). In technical terms, Pesando assumed that inflation was a five-period autoregressive process.

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<sup>2</sup>The assumption was that inflation followed what is known as an autoregressive process, but Pearce's estimates suggested that a moving-average process represents the data better. The difference is important both theoretically and in practice.

forecasts overlap somewhat — both include the period from December 1994 to June 1995.

Now suppose some disaster had struck the economy during that overlapping period. For example, suppose that OPEC tripled oil prices in March 1995. Then it's likely that consumer inflation would have risen sharply in March 1995, and your forecasts for both June 1994 to June 1995 and December 1994 to December 1995 would be far too low. This is the overlapping observations problem: a shock to the variable being forecast affects the forecast errors for several forecasts, not just one. This leads to problems in interpreting both plots of the data and econometric tests for bias and efficiency.<sup>3</sup> Bryan Brown and Shlomo Maital, in a 1981 article, showed how to deal with this problem using a sophisticated statistical procedure. They illustrated their results with the Livingston Survey, testing forecasts for inflation and several other variables. They found the Livingston Survey forecasts to be largely free of bias. They did find, however, that the forecasts are a bit inefficient; they don't use information about monetary policy (the growth rate of the money supply) to form better forecasts.

In a 1981 article, Stephen Figlewski and Paul Wachtel suggested that rationality tests should be performed on individual forecasts, not the average across individuals, which had been used by previous researchers. Using the average across forecasters could lead to an error in evaluating whether individual forecasters have rational expectations; it's possible that the individual forecasters could have rational expectations, but the average across forecasters would be biased, or vice versa. When Figlewski and Wachtel looked at the individual forecast

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<sup>3</sup>The problems arise because a shock, such as the oil-price shock in the example, that occurs in the overlapping period gives rise to forecast errors that are related to each other. But any relationship between forecast errors violates the assumptions needed to run the econometric tests for bias and efficiency described in the Appendix.

data from the participants in the survey, they found overwhelming evidence that the forecasts were biased and inefficient.

Many other papers found fault with the Livingston inflation forecasts. One of the more devastating notions was that simple models could do better than the Livingston Survey, as Pearce had found. In a notable 1984 paper, Eugene Fama and Michael Gibbons showed that simple models using interest rates could forecast inflation better than the Livingston Survey. They implied that because interest rates are formed in financial markets, they provide a better measure of expected inflation than the survey, which questions people who may not have a strong incentive to forecast well. As Frederic Mishkin put it in 1981, "One obvious danger with survey data is that there may be very little incentive for the respondents to answer accurately."

But recently, both the Livingston and other survey forecasts are being used more and more in the popular press and by researchers.<sup>4</sup> One reason is the realization that the negative results on the Livingston forecasts came during the 1970s and early 1980s, when inflation was very erratic because of oil-price shocks. For that period, the forecasts look bad and seem to be biased or inefficient. Since that time, however, inflation has become much more predictable. Rerunning the same tests for rationality (using the average across forecasters) as before leads to a much more favorable view of the Livingston forecasts, as I showed in a 1996 article.

**Testing Other Forecast Variables.** Though testing the inflation forecasts from the Livingston Survey has been its most important use, other variables in the survey have also been examined, including the stock market and real output.

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<sup>4</sup>See *Comparison to Other Surveys* for a discussion of some of the other forecasting surveys and how they differ from the Livingston.



## Comparison to Other Surveys

The Livingston Survey isn't the only survey of macroeconomic forecasts available, though it is the granddaddy of them all. Interest in the Livingston Survey led to the formation of many other surveys.

The ASA/NBER Business Outlook Survey, now known as the Survey of Professional Forecasters, started in 1968 as a joint venture of the American Statistical Association (ASA) and the National Bureau of Economic Research (NBER). University of Chicago professor Victor Zarnowitz was instrumental in getting the survey started in the fourth quarter of 1968. The survey was taken around the middle of each quarter and provided more detailed forecasts than the Livingston Survey. Participants were asked to provide forecasts for the current quarter, and one, two, three, and four quarters ahead, for many major macroeconomic variables. In 1981, the survey was extended to include all the components of real GNP. Unique to the survey is a set of questions about the probabilities that forecasters attach to different changes in GNP (GDP since 1992) and the price level. The Federal Reserve Bank of Philadelphia took over the survey in 1990. For further information, see my 1993 article.

In 1976, Robert Eggert discovered that interest in forecasts was so great that people wanted a more frequent survey of forecasts. His Blue Chip Economic Indicators has been a big success, and much research has been based on this survey. It has the advantage of being monthly, thus providing a lot more information than the Livingston Survey. But since it hasn't been around as long, researchers who need a longer time series can't use it. Nonetheless, many of the tests for bias and efficiency carried out on the Livingston Survey have also been done on the Blue Chip survey, with similarly mixed results.

The National Association of Business Economists (NABE) produces a survey of its members every quarter. It consists of annual forecasts for many macroeconomic variables and asks a variety of topical questions. The survey has been going on since the early 1960s and NABE maintains a database of the results.

Business publications such as the *Wall Street Journal* and *Business Week* also collect surveys of economists, although researchers are just now beginning to study their results.

The Livingston Survey's stock market forecasts have been examined in a number of articles. In 1980, Josef Lakonishok found that the forecasts (averaged across the forecasters) were biased and inefficient. In 1984, Douglas Pearce confirmed those results using the individual forecast data. But in 1989, Yoon Dokko and Robert Edelstein reached a contrary conclusion. They claimed that both earlier studies had miscalculated the expected returns to the stock market because survey participants had not provided a forecast for the current June or December value for the stock market index. For example, previous researchers assumed that in the June survey, forecasts were made on a particular day, but we know that, in fact, different participants sent in their forecasts on different days. Since day-to-day movements of the stock

market may be large, each survey participant was basing his or her forecast on a different base for the stock index.

To avoid this problem, Dokko and Edelstein used just the information on expected growth between the forecast of the stock market for the end of June and the end of December, which gives an exact six-month expected return, with no question about the forecast's horizon. When Dokko and Edelstein ran tests on their data, they found no bias or inefficiency in the Livingston forecasts. These findings suggest that the results of all these statistical tests are very sensitive to researchers' assumptions.

In a recent paper I've written with Laurence Ball of Johns Hopkins University, we examined the real GDP forecasts (as well as the inflation forecasts) from the Livingston Survey and how

they are influenced by monetary policy. While our results suggested that the survey forecasts were unbiased, they also indicated that the forecasts weren't efficient with respect to monetary policy. That is, the forecasters didn't fully use the information they had about monetary policy to form better forecasts. Instead, they seem to make small but systematic errors. When monetary policy changes: (1) they don't forecast a large enough change in output; and (2) they assume that inflation will respond to the change faster than it actually does. The results suggest that the forecasters may not have rational expectations. But other explanations for the forecast errors are also reasonable, such as the fact that changes in the financial structure of the economy have led to confusion about which variable accurately measures monetary policy.

**Other Uses of the Livingston Survey.** All of the studies discussed above tested the quality of the Livingston Survey's forecasts, especially to see if they were consistent with rational expectations theory. However, the survey has been used to test other economic theories. The forecasts have been used to study the relationship between nominal and real interest rates, to test the response of stock market forecasts to higher expected inflation, and to test theories of consumption spending.

The Fisher effect (named after economist Irving Fisher) describes the relationship between nominal and real interest rates. The nominal interest rate consists of two components: the real interest rate plus the expected rate of inflation. According to the theory of the Fisher effect, when the expected inflation rate rises one percentage point, the nominal interest rate should rise proportionally. This theory has been tested using the Livingston series on expected inflation. In 1972, William Gibson showed that a one-percentage-point increase in expected inflation would raise interest rates on bonds with maturities of a year or less about one percentage point, confirming the Fisher effect. But Gibson's study was flawed because it was based

on the data before Carlson's corrections were made, so Vito Tanzi redid Gibson's work with the corrected data. Tanzi's work did not support Gibson's results; he found that nominal interest rates don't rise one-for-one with expected inflation. Rather, both the state of the business cycle and the tax rate influenced the relationship between the nominal interest rate and the expected inflation rate.

In a 1983 study, N. Bulent Gultekin, using the Livingston Survey expectations of both inflation and stock returns, found that expected stock returns rose point-for-point with rises in expected inflation. Economic theory predicts this result, but previous empirical research, which hadn't used the Livingston forecasts, didn't support the theory.

Finally, a very influential paper in macroeconomics used the Livingston Survey to test the theory that people change the timing of their consumption expenditures depending on changes in interest rates. Robert Hall used the survey to represent the expected real returns to stocks and to short-term Treasury securities. Hall's results surprised many economists because they suggested that consumption spending didn't respond much to changes in expected real interest rates. Previous studies had reached the opposite conclusion.

## SUMMARY

The Livingston Survey has proven to be a valuable tool for measuring economists' forecasts of macroeconomic variables over the past 50 years. It was instrumental in testing the theory of rational expectations in the late 1970s and early 1980s. While the survey's inflation forecasts seemed to fail the tests of rational expectations 15 to 20 years ago, more recent tests show that the forecasts are much better, though perhaps not perfect. The survey has also been used to test the rationality of forecasts of other variables and to test theories of interest rates, stock returns, and consumption spending.

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## APPENDIX

### Testing for Bias and Efficiency

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A number of different tests have been used in the literature on bias and efficiency. The most well known are fairly simple and are described in this appendix. For more complicated tests, the reader can refer to the research studies described earlier in this article.

Given a set of forecasts,  $F_t$ , for a variable  $X_t$ , a simple bias test involves running the regression  $X_t = \alpha + \beta F_t + \varepsilon_t$ . If the estimated value of  $\alpha$  is 0 and the estimated value of  $\beta$  is 1, the forecasts are unbiased. Formal statistical tests can be performed to see if the estimated value of  $\alpha$  is close enough to 0 and the estimated value of  $\beta$  is close enough to 1 to consider the forecasts to be unbiased.

An efficiency test requires determining if the forecast errors ( $X_t - F_t$ ) are systematically related to some other variable that was known to the forecaster when the forecasts were made. Suppose this other variable is denoted  $Z_t$ . Then the efficiency test requires running a regression of the form  $X_t - F_t = \gamma + \delta Z_t + \nu_t$ . If the estimated value of  $\delta$  is significantly different from 0, the forecasts are inefficient. It should be possible to use the existing forecasts with the information about  $Z_t$  to form a better forecast.

Bias and inefficiency are different concepts, so forecasts can be biased but efficient or they can be unbiased but inefficient.

The

# LIVINGSTON

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Federal Reserve Bank  
of Philadelphia

December 1996

## **Economy is holding steady**

The 52 forecasters in the semi-annual Livingston Survey forecast a growth rate of 2.3 percent for the economy in the last quarter of 1996. Growth for the first half of 1997 is forecast to be 2.0 percent, with a slight increase to 2.3 percent in the second half of the year. Average growth for all of 1997 is forecast to be 2.1 percent.

## **Unemployment rate shows little change**

Economists forecast little change in the unemployment rate over the next year: 5.3 percent in June and 5.4 percent in December 1997. Only a modest increase is forecast for 1998 when the unemployment rate is expected to average 5.6 percent.

## **Inflation expectations are revised slightly downward**

Survey participants forecast

a decline in inflation over the next year. Consumer price inflation as measured by the Consumer Price Index is expected to be 3.1 percent in the first half of 1997. Economists forecast a moderate drop in inflation, to 2.9 percent, in the second half.

The forecast for inflation over the next 10 years fell to 3.0 percent, a 0.1 percent decrease from the forecast in the last survey.

The Producer Price Index (PPI) also shows little change in inflation. Economists forecast that the PPI growth rate will be 2.4 percent in both the first and second halves of 1997.

## **Wage growth is expected to rise**

Wages stay in line with the inflation rate—3.1 percent—for the first half of the year. But in the second half of 1997, wage growth is expected to increase to a rate of 3.3 percent,

slightly higher than inflation.

## **Interest rates change little**

Survey forecasters predict a slight increase in the U.S. Treasury bond's interest rate, from 6.6 percent at the end of 1996 to 6.7 percent by the end of June 1997. However, they forecast that rates will fall back to 6.6 by the end of 1997 and fall further, to 6.4 percent, by the end of 1998. Forecasts for the Treasury bill show the same pattern: 5.1 percent at the end of 1996, 5.2 percent at the end of 1997, and 4.9 percent at the end of 1998.

## **Stock market will continue to expand**

Economists forecast continued expansion in the S&P 500 at a level of 738.5 for the end of 1996, 750.6 for the end of 1997, and 763.4 for the end of 1998. This translates into a growth rate of 1.6 percent for 1997 and 1.7 percent for 1998.