# How Accurate Are Professional Economic Forecasts?

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**Abstract**

*This paper examines the forecast accuracy of the ASA-NBER survey annual data on seven major macroeconomic indicators for 1983-1991. Although no single forecaster was consistently accurate, it is generally shown that (i) the average forecast error is reasonably low, (ii) the forecast accuracy and the forecasters' agreement on their mean forecast improve as the forecast horizon becomes shorter, and (iii) the consensus of professional forecasts is superior to the naive forecast.*

## Introduction

Nearly all responsible business decisions attempt to account in some way for what is going to happen in the future. Whether he takes his cues from market trends, newspaper reports, government forecasts or simply the talk on the street, the successful manager is constantly incorporating predictions in his planning. But which of the available prognostications is best? Bernstein and Silbert (1984) make a good case that professional forecasts are likely to be better than naive predictions, especially for economic measures where market values are not directly driven by expectations. Of course it is easy to find examples of forecasts that were very wide of the mark, and these are well reported in the media, especially when the economy has just taken an unexpected turn. How good, then, is the track record of professional forecasters? If we examine their overall performance, and not just examples of unusually good (or bad) prediction, how accurate are they?

Perhaps the best source of information to answer these questions is the survey of professional economic forecasters initiated in 1968 by the American Statistical Association and the National Bureau of Economic Research (ASA-NBER). Initially this *quarterly* survey sought to obtain forecasts on ten U.S. macroeconomic variables for the current quarter and the following four quarters. In the third quarter of 1981 it was modified to exclude four and add eleven other variables. Since then the participants have also been asked to provide *annual* forecasts of each target variable for the current year and the following year.

In this study, we are interested in analyzing these ASA-NBER survey *annual* forecasts for real GNP, implicit price deflator, residential and non-residential investment expenditures, unemployment rate, the three-month Treasury bill rate, and consumer price index (CPI) inflation rate.[1] These seven indicators were chosen because they are representative of the range of variability in the data, and because of their interest to the business community. Section 2 will describe the survey forecasts and the method of analysis used in answering the questions posed. Section 3 will present the empirical results. Section 4 will offer the conclusion.

## ASA-NBER Survey Annual Forecasts and Methodology

The ASA-NBER survey questionnaire is sent out sometime at the end of the first month of the quarter, and the survey participants are asked to mail back the completed questionnaire by the end of the second month. Since the survey is conducted on a quarterly basis, the participants forecast the annual value of each target variable eight times at eight subsequent quarters. For example, for the 1983 value, the 1st survey forecast, referred to as the 8-quarter-earlier forecast, is made in the second month of 1982.Q1; the 2nd survey forecast, referred to as the 7-quarter-earlier forecast, is made in the second month of 1982.Q2; and the 8th survey forecast, referred to as the 1-quarter-earlier forecast, is made in the second month of 1983.Q4. That is, the survey participants are given the opportunity to revise their forecast on a quarterly basis, as new information becomes available. Utilizing the ASA-NBER current year and the following year individual survey forecasts since 1982.Q1, we have eight different sets of individual forecasts for each year from 1983 to 1991.

As the first step, we want to see how the forecast accuracy varies with the amount of time between the date of the forecast and the date of the actual value. This is investigated by calculating the mean absolute percent error of the i-quarter-earlier forecast ($MAPE_i$) defined as

$$MAPE_i = (T \cdot N)^{-1} \cdot \left( \sum_{t=1983}^{1991} \sum_{j=1}^{N} | (P_{ijt} - A_t)/A_t | \cdot 100 \right), \quad i = 1,2,\ldots,8$$

where T is the number of years (= 9), N is the number of respondents,[2] $A_t$ is the actual value for year t, and $P_{ijt}$ is the jth respondent's i-quarter-earlier forecast of $A_t$. The actual value of each variable, say for 1983, is represented by the preliminary annual figure, reported in the 1984 January issue of the *Business Conditions Digest* and the *Survey of Current Business*. As common sense suggests, forecast accuracy is expected to improve as the target date gets closer. That is, $MAPE_i$ should become smaller as i approaches one.

As the second step, we want to see how the forecasters' agreement on their mean forecast improves as the target date gets closer. This is investigated by calculating the i-quarter-earlier mean absolute percent deviation ($MAPD_i$) of the individual forecasts from the mean forecast, $\overline{P}_{it}$. That is,

$$MAPD_i = (T \cdot N)^{-1} \cdot \left( \sum_{t=1983}^{1991} \sum_{j=1}^{N} | (P_{ijt} - \overline{P}_{it})/\overline{P}_{it} | \cdot 100 \right), \quad i = 1,2,\ldots,8$$

where

$$\overline{P}_{it} = N^{-1} \cdot \sum_{j=1}^{N} P_{ijt}.$$

Again, $MAPD_i$ is expected to become smaller, as i approaches one. This implies that the average deviation of the individual forecasts from the mean forecast should decline, or the forecasters' agreement on the mean forecast should improve, as the target date gets closer.

As the third step, we use Theil's (1971) U-Statistic to compare the root mean squared forecast error of the ASA-NBER survey model, $RMSE_i^s$, with the root mean squared forecast error of a naive model, $RMSE_i^n$. That is,

$$U_i = RMSE_i^s / RMSE_i^n$$

where

$$RMSE_i^s = \left( T^{-1} \cdot \sum_{t=1983}^{1991} (\overline{P}_{it} - A_t)^2 \right)^{1/2} \qquad i = 1,2,\ldots,8$$

and noting that the naive model sets the forecast equal to the most recently known actual value of the target variable (i.e.,$A_{t-1}$ for i = 1, 2, 3, 4, and $A_{t-2}$ for i = 5, 6, 7, 8),

$$RMSE_i^n = \left( T^{-1} \cdot \sum_{t=1983}^{1991} (A_{t-1} - A_t)^2 \right)^{1/2} \qquad i = 1,2,3,4,$$

and

$$RMSE_i^n = \left( T^{-1} \cdot \sum_{t=1983}^{1991} (A_{t-2} - A_t)^2 \right)^{1/2} \qquad i = 5,6,7,8.$$

The U-statistic gives an indication of the absolute quality of the survey forecast against that of the naive model. It would equal zero in the case of a perfect forecast and it would equal one for any series of forecasts as inaccurate as the naive forecast.

Before proceeding further, note that when making the current year forecast (i = 1, 2, 3, 4), some information is available to the forecaster that constitutes part of the target value. That is, the first month data for the variables measured monthly are available when making the 4-quarter-earlier forecasts. The first four months of data for the variables measured monthly and the first quarter data for the variables measured quarterly are available when making the 3-quarter-earlier forecasts, and so on. In contrast, when making the following year forecast (i = 5, 6, 7, 8), there is no information that constitutes part of the target value. Accordingly, one may expect the degree of improvement to be larger when moving from the 4- toward the 1-quarter-earlier forecast and smaller when moving from the 8- toward the 4-quarter-earlier forecast.

**Empirical Results**

Table 1 reports our analysis results of the ASA-NBER survey annual forecasts for the real GNP, implicit price deflator, residential and non-residential investment expenditures, unemployment rate, three-month Treasury bill rate, and consumer price index (CPI) inflation rate.

An overall look at the results reveals that the size of forecast error varies significantly from one indicator to another. It should come as no surprise that some macroeconomic indicators are easier to forecast than others. The general time dependence of forecast error is also about what common sense would lead us to expect. That is, in general, earlier forecasts are less accurate than later forecasts, and the average deviation of the individual forecasts from the mean forecast also becomes smaller as the forecast horizon becomes shorter.

The $MAPE_i$ for real GNP and the implicit price deflator are the lowest for any of our chosen indicators, remaining below 3% even for the 8-quarter-earlier forecast. The $MAPD_i$ also declines as i approaches one, implying that forecasters' agreement on the mean forecast improves as the target date gets closer. As a distinct anomaly, however, the MAPE of the 4-quarter-earlier forecast is larger than that of the corresponding 5-quarter-earlier forecast. When making the 4-quarter-earlier forecast, the participants know the just released preliminary value of the series for the previous year. A

TABLE 1. ASA-NBER Survey Annual Forecasts: 1983-1991 (T = 9)

| Variables | 1-Qtr Earlier Forecast | 2-Qtr Earlier Forecast | 3-Qtr Earlier Forecast | 4-Qtr Earlier Forecast | 5-Qtr Earlier Forecast | 6-Qtr Earlier Forecast | 7-Qtr Earlier Forecast | 8-Qtr Earlier Forecast |
|---|---|---|---|---|---|---|---|---|
| **Real GNP (Q)** | | | | | | | | |
| MAPE | 0.14 | 0.33 | 0.84 | 1.64 | 1.30 | 1.69 | 2.00 | 2.83 |
| MAPD | 0.08 | 0.18 | 0.27 | 0.41 | 0.55 | 0.92 | 0.92 | 1.18 |
| U | 0.06 | 0.13 | 0.30 | 0.55 | | | | |
| U | | | | | 0.24 | 0.35 | 0.40 | 0.56 |
| **Implicit price deflator (Q)** | | | | | | | | |
| MAPE | 0.17 | 0.27 | 0.51 | 1.32 | 0.95 | 1.30 | 1.68 | 2.38 |
| MAPD | 0.18 | 0.18 | 0.24 | 0.48 | 0.51 | 0.63 | 0.99 | 1.13 |
| U | 0.11 | 0.11 | 0.21 | 0.56 | | | | |
| U | | | | | 0.18 | 0.27 | 0.35 | 0.45 |
| **Real residential investment (Q)** | | | | | | | | |
| MAPE | 1.18 | 1.74 | 3.05 | 5.25 | 6.06 | 7.92 | 8.55 | 9.81 |
| MAPD | 0.92 | 1.26 | 2.06 | 2.15 | 3.80 | 4.44 | 5.69 | 5.10 |
| U | 0.49 | 0.43 | 0.71 | 1.02 | | | | |
| U | | | | | 0.48 | 0.58 | 0.80 | 0.86 |
| **Real non-residential investment (Q)** | | | | | | | | |
| MAPE | 1.34 | 1.58 | 2.87 | 4.60 | 5.40 | 6.63 | 8.16 | 8.72 |
| MAPD | 0.33 | 0.49 | 1.08 | 1.44 | 1.98 | 2.55 | 3.11 | 2.89 |
| U | 0.38 | 0.32 | 0.48 | 0.66 | | | | |
| U | | | | | 0.51 | 0.68 | 0.79 | 0.87 |
| **Unemployment rate (M)** | | | | | | | | |
| MAPE | 0.56 | 1.33 | 2.76 | 5.09 | 6.83 | 8.63 | 10.82 | 13.60 |
| MAPD | 0.89 | 0.97 | 1.64 | 1.84 | 3.47 | 3.90 | 4.33 | 4.68 |
| U | 0.14 | 0.15 | 0.28 | 0.52 | | | | |
| U | | | | | 0.40 | 0.50 | 0.63 | 0.80 |
| **3-month T-bill rate (M)** | | | | | | | | |
| MAPE | 1.08 | 2.51 | 5.46 | 12.00 | 14.76 | 19.24 | 24.82 | 24.63 |
| MAPD | 0.96 | 2.11 | 2.87 | 3.62 | 6.05 | 7.81 | 8.00 | 7.66 |
| U | 0.09 | 0.16 | 0.33 | 0.71 | | | | |
| U | | | | | 0.47 | 0.69 | 0.85 | 0.82 |
| **CPI inflation rate (M)** | | | | | | | | |
| MAPE | 8.62 | 11.84 | 14.27 | 25.46 | 35.22 | 49.67 | 46.93 | 44.93 |
| MAPD | 8.29 | 11.29 | 12.29 | 11.23 | 10.30 | 13.39 | 17.27 | 14.93 |
| U | 0.36 | 0.44 | 0.55 | 0.73 | | | | |
| U | | | | | 0.54 | 0.74 | 0.76 | 0.77 |

**Notes:** MAPE is the mean absolute percent forecast error; MAPD is the mean absolute percent deviation of the individual forecasts from the mean forecast; U, the Theil's (1971) U-statistic, compares the root mean squared survey forecast error with that of a naive model which sets the forecast equal to the recently known previous year actual value. Q (M) indicates that the variable is measured on a quarterly (monthly) basis.

closer look at the survey data reveals that, for both real GNP and implicit price deflator, the 4-quarter-earlier forecast in 1985, 1986, and 1990 is surprisingly close to the previous year preliminary value. This, while suggesting the use of a naive forecasting strategy for these certain years, has raised the MAPE of the 4-quarter-earlier forecast above that of the 5-quarter-earlier forecast. Such a misforecasting, however, is corrected for in the next round of forecast revision with the 3-quarter-earlier forecasts showing substantial improvements. The low U-statistics for these two indicators, in general, signify the superiority of consensus forecasts over the naive forecasts for the whole sample period.

Consensus forecasts for real residential investment and real non-residential investment show an intermediate level of accuracy. The $MAPE_i$ declines in proportion to the forecast horizon in a nearly linear relationship, ranging from almost 10% for an 8-quarter-earlier-forecast to almost 1% for a 1-quarter-earlier forecast. The $MAPD_i$ is higher for residential than for non-residential investment and again shows the expected decline as the forecast horizon becomes shorter. In addition, except for the 4-quarter-earlier of real residential investment, the U-statistic is reasonably less than unity at all forecast horizons, indicating the superiority of the consensus over the naive forecasts.

The survey participants are more accurate in forecasting the unemployment rate than the three-month Treasury bill rate. For instance, the $MAPE_i$ of the interest rate forecasts are more or less twice as large as the $MAPE_i$ of the unemployment rate forecasts. Similar pattern is also observed with respect to the MAPD statistics of these two indicators, indicating the higher degree of disagreement among forecasters on their interest rate forecasts than on their unemployment rate forecasts. Even though the overall forecast accuracy of these two indicators is lower than, say, real GNP or implicit price deflator, the self-consistency of the forecasts, in general, is still similar to what common sense suggests. Furthermore, as suggested by the reported U-statistics, consensus forecasts of these indicators are considerably better than the naive forecasts.

The CPI inflation rate, with the MAPE of about 45% for the 8-quarter-earlier forecast and over 8% for the 1-quarter-earlier, is the most difficult of these indicators to forecast. $MAPD_i$ is also very much greater, especially for the shorter horizon forecasts, signifying the wider disagreement among the survey participants on what the rate of inflation would be. In addition, the CPI inflation rate forecasts, unlike those of other indicators in Table 2, show a weaker degree of improvement when moving from the 3- to the 1-quarter-earlier forecast. Even though the relation between forecast accuracy and forecast horizon seems to be non-linear, the consensus forecast of the CPI inflation rate, as indicated by the U-statistic, is still superior to the naive forecast at all forecast horizons.

**Conclusion**

Our examination of the ASA-NBER survey annual forecasts on seven major macroeconomic indicators suggests that the performance of the forecasters who responded to the survey has been reasonably good. That is, the mean response to the survey, measured by the MAPE, shows a reasonably small error, and the average deviation of the individual responses from the mean response, measured by the MAPD, is not large (see Table 1). Based on a closer look at the survey data, it should be noted that no one forecaster was consistently accurate. Accordingly, while it may be risky to count on the forecasts of any one forecaster, their consensus opinion is good and reasonably better than a naive forecast as indicated by the U-statistic.

**Suggestion For Future Research**

This study utilizes such statistics as MAPE, MAPD, and Theil's U-statistic to examine how forecast accuracy varies in relation to forecast horizon. For future research, it may be interesting to examine this relation in terms of richer statistical properties such as unbiasedness, efficiency, and orthogonality, in line with Zarnowitz (1985) and Baghestani and Kianian (1993). Another possibility is to investigate the information content of the forecasts at various forecast horizons by utilizing comparable ARIMA and VAR nonsurvey forecasts as benchmarks (see Baghestani, 1992).

*****Footnotes*****

1. See Zarnowitz (1985) and Baghestani and Kianian (1993) for the evaluation of the *quarterly* forecasts of the ASA-NBER survey.
2. The average number of respondents for our study period is 28. In the summer of 1990 the survey was taken over by the research center of the Federal Reserve Bank of Philadelphia.

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