Surveys of Inflation Expectations: Forward or Backward Looking?

Many economists believe that surveys of price forecasts (expectations) are "forward looking" in that they make use of information about current and future economic policies and about developments of other variables. This forward-looking feature presumably distinguishes these surveys from the purely "backward-looking" measures of inflation expectations based on past experience. If households and businesses hold forward-looking inflation expectations, they would pay less attention, in making their decisions, to past movements of inflation and more to current developments and changes in economic policies. In this sense, the nature of expectations behavior is an important factor in determining the outcome of economic policies

The evidence seems to indicate, however, that survey price forecasts *are not* forward looking or "rational" in the sense of incorporating information about current and future periods. In fact, they appear to be lagging indicators of actual inflation rates; expectations contained in them are essentially adaptive in character. The inflation forecasting performance of these surveys is roughly similar to forecasts based on recent past experience with inflation

Two well-known surveys of price expectations are those conducted by Joseph Livingston of the *Philadelphia Inquirer* and by the Michigan University's Institute for Social Research. We examined both these surveys to determine (1) whether they are forward looking or backward looking and (2) whether their ability to track inflation is better or worse than purely backward-looking inflation expectations based on past experience.

Charts 1 and 2 plot the Livingston and Michigan survey inflation forecasts and *actual* consumer price inflation for the corresponding periods In both cases the survey expectations of inflation rates lag actual inflation rates, particularly in upturn phases of inflation. Two other

features of the charts are also inconsistent with the forward-looking behavior First, the survey forecasts appear, on average, to underpredict inflation systematically, although in the case of the Michigan survey this underprediction is rather small Second, they tend to smooth the peaks and valleys of actual inflation rates, which is reflected in the large discrepancy (*i.e.*, average absolute error) between the forecasted and the actual inflation rates As shown in the left-hand upper corner of the charts, the downward bias of inflation forecasts and the average absolute error are particularly significant in the case of the Livingston survey

More rigorous analysis of data underlying the charts confirms the impression that the Livingston and Michigan survey forecasts are not forward looking. If survey expectations were forward looking or rational, they would tend to be free of any serious systematic underprediction or overprediction, and any errors between actual and predicted inflation rates would be completely random. Both surveys failed to meet these conditions in our formal tests. The survey forecasts systematically deviate from actual inflation rates and do not incorporate all available information on past inflation rates; that is, forecasts could have been improved by making better use of past inflation experience.

In technical terms, we tested the forward-looking (or rationality) hypothesis by estimating the following equation:

$$p = a_0 + a_1 p^e + u$$

where p is the actual rate of inflation, p^e is the survey expectation of inflation, and u is an error term. If the estimated value of a_0 and a_1 are equal to 0 and 1, respectively, this equation implies that the survey forecasts would be unbiased predictions of future inflation. In addition, such forecasts would incorporate all available information from the past if the prediction errors (u's) are random, *i e.*, there is no serial correlation of residuals In this case, one would learn nothing from past prediction errors in forecasting future inflation

Estimates of the above equation for the Livingston and Michigan inflation forecast data are reported in Table 1. They indicate that survey expectations are not forward looking.[1] In particular, an F statistic test for the

[1]For the conversion of the price-level forecasts of the Livingston survey into expected inflation rates, we followed the formal procedures of Stephen Figlewski and Paul Wachtel in their article, "The Formation of Inflationary Expectations", *The Review of Economics and Statistics* (1981), pages 1-10 Because of the timing of the availability of data to the economists in this survey, the predicted rates of change are actually eight-month rates of change Compare with Edward M Gramlich, "Models of Inflation Expectations Formation", *Journal of Money, Credit and Banking* (1983), pages 155-73

Chart 1

Inflation Tracking Performance of Livingston Survey Data

Seasonally adjusted annual rates

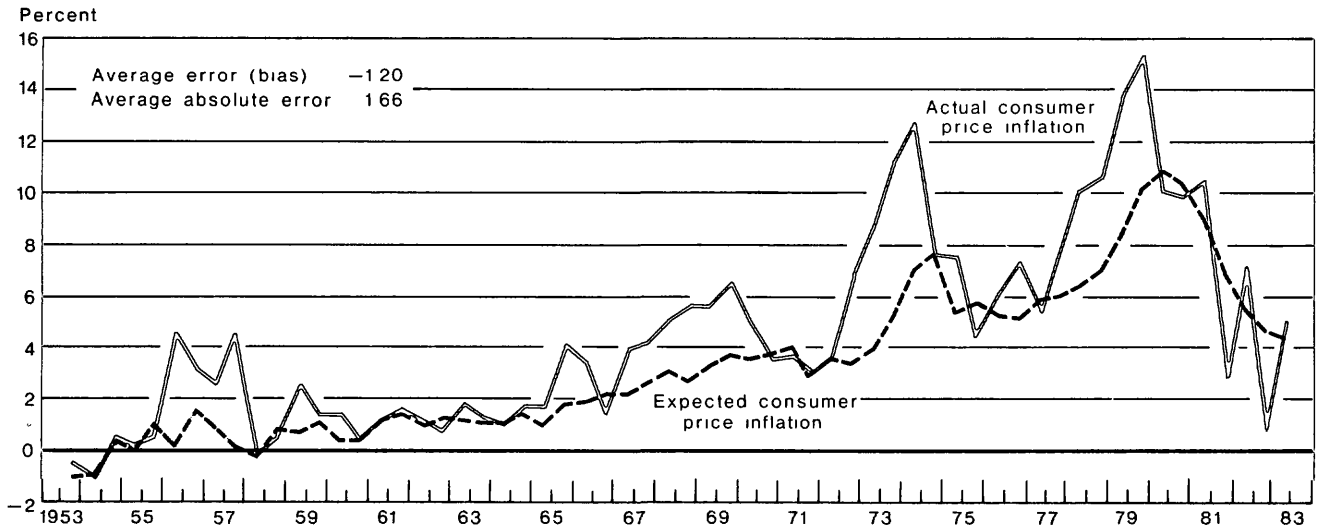
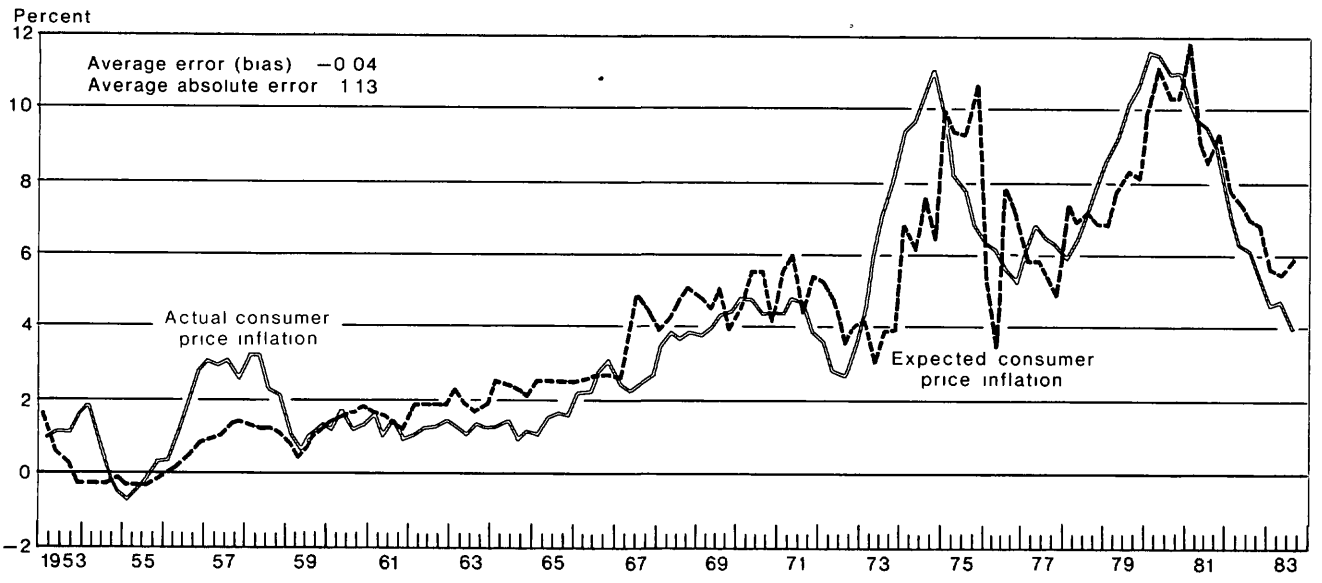


Chart 2

Inflation Tracking Performance of Michigan Household Survey Data

Seasonally adjusted annual rates



joint hypothesis that $a_0 = 0$ and $a_1 = 1$ is rejected by the data, and the residuals from the regressions appear to contain a high level of serial correlation Thus, both survey forecasts of inflation are biased and do not make efficient use of information from preceding periods in forecasting future inflation

Even though the two survey inflation forecasts are not forward looking in a strong statistical sense, it could be that they contain more information than purely backward-looking inflation expectations and provide better forecasts of actual inflation than the latter An examination of the data suggests, however, that this is not the case. The survey inflation forecasts for any given period appear to follow closely the actual inflation performance over the preceding periods It is as if the survey forecasters are projecting the recent past experience into the future; for example, shifting the position of the actual inflation line forward by one period in Charts 1 and 2 tends to match up actual inflation rates more closely with the survey inflation forecasts

To pursue this analysis further, Table 2 compares the Livingston and Michigan forecasts with a simple extrapolation and with a "standard backward-looking" forecast. The extrapolation forecast assumes that inflation in the next half year remains unchanged from the last half year, while the standard backward-looking forecast is based on a distributed lag over the last two periods

The Michigan survey forecasts and the two backward-looking forecasts deviate, on average, by slightly more than 1 percentage point from actual inflation rates The three forecasts also exhibit a virtually identical small downward bias or underprediction. By contrast, the Livingston survey forecasts are considerably less accurate and more downward biased.

The predictive power—which measures, on a scale of 0 to 1, the ability of inflation forecasts to track actual inflation—of all four forecasts in Table 2 is virtually the same When the predictive power is close to 0, there is little evidence of forecasting ability, even if the average error is quite small The predictive ability of all four forecasts is significantly less for the period after 1970 than for the longer period. All four forecasts also become considerably less accurate in the 1970s. However, there is no significant change in the bias of backward-looking forecasts, whereas underpredictions from the two survey forecasts are more pronounced

Table 1

Tests of the Forward-Looking or Rational Expectations Forecasting Hypothesis

Statistics	Livingston (economists) 1953-83	Michigan (households) 1949-83
***No correction for serial correlation:**		
a_0	0 81	0 77
	(2 03)†	(3 11)‡
a_1	1 11	0 86
	(1 26)	(2 66)†
R^2	0 72	0 66
SEE	2 04	1 91
D W	1 41	0 44
§F-statistic	22 34‡	9 86‡
‖Chi-squared statistic	31 57‡	175 36‡
Correction for serial correlation:		
Rho	0 30	0 96
	(2 39)†	(41 46)‡

*Absolute t-ratios for a_0 and Rho around 0 and for a_1 around 1 are reported in parentheses beneath the coefficients
†Significant at 5 percent level
‡Significant at 1 percent level
§For the joint hypothesis that $a_0 = 0$ and $a_1 = 1$
‖For tests if the resulting residual series are white noise (not serially correlated)

Table 2

Bias, Accuracy, and Predictive Power of Survey and Backward-Looking Forecasts

Periods of observation	Survey forecasts: Livingston	Survey forecasts: Michigan	Backward-looking forecasts: Simple extrapolation	Backward-looking forecasts: Standard backward
***1953-83:**				
Average error (bias)	−1 20	−0 04	−0 03	−0 04
Average absolute error	1 66	1 13	1 18	1 17
†Predictive power	0 73	0 80	0 78	0 78
***1970-83:**				
Average error (bias)	−1 45	−0 15	0 04	0 04
Average absolute error	2 29	1 44	1 62	1 62
†Predictive power	0 45	0 51	0 52	0 51

Rates of inflation are annualized six-month rates of change The "simple extrapolation" assumes that inflation in the next half year remains unchanged from the last half year The "standard backward" looking forecast is a two-period distributed lag (coefficients add up to one) on the rates of inflation

*The forecast errors are defined as $e_t = p^e_t - p_t$, where p_t is the actual rate of inflation and p^e_t is the corresponding expected rate of inflation, the average (mean) error, *i e*, bias, and the average (mean) absolute error are expressed in percentage points

†The predictive power (coefficient of determination) indicates on a scale from 0 to 1 how closely related the forecasted and predicted rates of inflation were It gives the percentage of variation in the actual rate of inflation predicted by the forecast

over the 1970-83 period than over the whole period.

In sum, our analysis suggests that survey inflation expectations are not forward looking On the contrary, they follow actual inflation with a lag. The *average* inflation forecasts provided by the Livingston and Michigan surveys are not very accurate and frequently tend to be downward biased. On the whole, their performance appears to be essentially similar to (or perhaps slightly weaker than) that of inflation expectations exclusively based on immediate past data for inflation.

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