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Comparing Inflation Expectations of Households and Economists

by James M. Hvidding

While the Economic Review primarily contains articles by economists associated with the Bank or the Board of Governors, occasionally we receive comments from readers that are appropriate for the Review. Prof. Hvidding's comment on an earlier Review article by Michael Bryan and William Gavin is one such case.

This comment extends Bryan and Gavin's earlier Economic Review article (1986 Quarter 3) on measuring inflation expectations. Using a different frequency of observations, Prof. Hvidding's results support Bryan and Gavin's findings that the Michigan Survey dominates the Livingston Survey as a forecast of inflation. Using quarterly observations, he finds, however, that the Michigan survey forecasts inflation slightly better than the time series method, while Bryan and Gavin find the opposite using semiannual data.

— Editor

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In a recent issue of this Review, Bryan and Gavin (1986a) hereinafter referred to as GB, compared the forecast accuracy of three alternative series of inflation forecasts: the Livingston survey of Economists' CPI forecasts, the Michigan survey of household inflation expectations, and a generated series of out-of-sample time-series forecasts of the inflation rate. They concluded that the household survey is a more accurate forecast of inflation than the Livingston survey of economists' forecasts but that "the relatively simple time-series model...performed about as well as the Michigan survey." This note addresses the second part of this conclusion.

The BG study was designed primarily to compare the Livingston and Michigan surveys. Since these two surveys measure different expectations, some compromises had to be made. First, in fairness to the semiannual Livingston survey, half the observations from the quarterly Michigan survey had to be ignored. Second, a choice had to be made whether to treat the forecasts as June to June (Livingston) or May to May (Michigan).[1] Given the outcome of the study, BG made the correct choice in picking June to June. Handicapping the Michigan survey in this way strengthens their primary conclusion that the Michigan survey is superior to the Livingston survey. But using only half of the available observations and measuring forecast accuracy on the wrong forecast horizon is not appropriate if the objective is to compare the Michigan survey with a generated alternative forecast.

To provide a more appropriate comparison of the Michigan survey and the generated forecast, I generated out-of-sample time-series forecasts for both the June to June and May to May forecast periods using a seasonally adjusted CPI series supplied to me by BG. Using semiannual observations on the June to June series, I was able to replicate their results almost exactly. These results are reported in tables 1(a) and 2(a).[2] I then repeated the forecast comparison using

■ 1 The Livingston survey is conducted semiannually in June and December and asks its respondents to forecast the level of the Consumer Price Index for the following June or December. The forecasts are therefore "June to June" (or December to December). The Michigan survey is taken quarterly in February, May, August, and November. Here the respondents are asked to predict what will happen to the prices of the things they buy "over the next twelve months." The forecasts are from February to February, May to May, and so on.

■ 2 BG did not present figures for the "naive" forecast (the inflation rate for the year preceding the forecast date). It is included here to facilitate comparison between the semiannual data used by BG and the quarterly data presented here.

TABLE 1

Forecast Accuracy

(a) Semiannual Observations: June 1966 - June 1987

Forecast	MAE	RMSE	U	U^M	U^R	U^D
Naive	2.205	2.744	1.000	0.000	0.197	0.802
Livingston	2.303	3.006	1.096	0.203	0.015	0.782
Michigan	1.871	2.362	0.861	0.037	0.000	0.963
Time-Series	1.870	2.335	0.851	0.018	0.107	0.876

(b) Quarterly Observations: June 1966 - June 1988

Forecast	MAE	RMSE	U	U^M	U^R	U^D
Naive	2.164	2.663	1.000	0.000	0.188	0.812
Michigan	1.612	2.030	0.762	0.026	0.020	0.954
Time-Series	1.823	2.301	0.864	0.000	0.179	0.821

KEY:
MAE — Mean absolute error.
RMSE — Root mean squared error.
U — Ratio of forecast RMSE to naive forecast FMSE.
U^M — Fraction of forecast error due to bias.
U^R — Fraction of forecast error due to difference of regression coefficient from unity.
U^D — Fraction of forecast error due to residual variance.
SOURCE: Author.

quarterly observations on the May to May series.[3] These results are reported in tables 1(b) and 2(b). Table 1(b) reports measures of forecast accuracy for quarterly observations on the Michigan survey and the May to May time-series forecast over the period covered in BG. Here the Michigan survey is shown to be noticeably more accurate that the time-series forecast.

In addition to the standard measures of forecast accuracy, BG presented the results of a conditional efficiency test employing the regression equation:

$$(1) \quad \pi_t = \beta_0 + \beta_1 x^*_{1t} + \beta_2 x^*_{2t} + \ldots \beta_n x^*_{nt} + U_t$$

where π_t is the inflation rate and the $^*_{it}$ are n linearly independent forecasts of w, . Forecast i is "conditionally efficient" relative to the other forecast if $\beta_i = 1$ and $\beta_j = 0$ for all j i. Table 2(a) shows that the hypothesis that the Livingston survey is conditionally efficient relative to the Michigan survey and the time-series forecast can be rejected at the one percent significance level for the June observations (equation [1]) and at the five percent level of significance for the December observations (equation [2]). The conditional efficiency hypothesis is not rejected in either equation for the Michigan survey or the time-series forecast. These findings lead BG to conclude that the household survey and the time-series forecasts are statistically comparable.

In conducting their conditional efficiency test, BG divided the sample of semiannual observations into two series of annual observations and ran two separate regressions. This treatment is used in order to avoid the serially correlated error term that inevitably arises when the sampling interval is less than the forecast horizon. Hansen and Hodrick (1980) have demonstrated

■ 3 The generated time-series forecast used by BG (and reported in tables 1(a) and 2(a)) is actually a forecast of the change in the log of the CPI, which, as BG explicitly note, is only an approximation of the annual percentage change in the CPI. It just happens that this approximation makes the time-series forecast appear to be more accurate than it really is. When the delta-log forecasts are converted to percentage change forecasts, the RMSE for the semiannual time-series forecast is 2.407, as opposed to the 2.335 reported in table 1(a). The time-series forecasts used in generating the results reported in table 1(b) and 2(b) have been converted to annual percent change forecasts.

TABLE 2

Conditional Efficiency Tests

	(a) Annual		(b) Quarterly[b]	
	(1)	(2)	(3)	(4)
Time Period	June 66 - June 85	Dec 66- Dec 84	66:2-85:2	66:2-85:2
Constant	0.161	3.070	0.139	-0.195
	(0.09)	(1.58)	(0.18)	(0.25)
Naive			(-0.347)	
			(0.67)	
Test Statistic[a]			32.48	
			(.000)	
Livingston	-0.291	0.022		
	(0.69)	(0.04)		
Test Statistic[a]	5.67	3.28		
	(.005)	(.040)		
Michigan	0.784	-0.591	0.715	0.757
	(1.73)	(0.73)	(1.29)	(1.24)
Test Statistic[a]	0.83	1.50	6.25	2.62
	(.526)	(.252)	(.181)	(.454)
Time-Series	0.495	1.124	0.631	0.297
	(1.27)	(2.33)	(1.13)	(0.72)
Test Statistic[a]	1.43	0.67	14.24	11.56
	(.269)	(.622)	(.007)	(.009)
No. of Obs.	20	19	77	77
R^2	.674	.507	.641	.627
Durbin-Watson	1.560	1.239	0.838	0.621

NOTE: t-statistics for coefficients and significance levels for test statistics are in parentheses.
a. For the joint hypothesis that the coefficient is one and all other coefficients in the regression are zero. For equations using annual data this is an F-statistic. For equations using quarterly data it is Chi-square as suggested by Hansen and Hodrick (1980).
b. The t-statistics for the equations using quarterly data are derived from the adjusted standard errors as suggested by Hansen and Hodrick (1980).
SOURCE: Author

an alternative approach that is asymptotically more efficient. Their treatment includes all observations in the OLS regression and employs an estimate of the implied autocovariances of the residuals to calculate a Chi-square statistic for hypotheses concerning restrictions on the regression coefficients.[4] Table 2(b) reports the results of conditional efficiency tests employing all quarterly observations on the forecast series.

The naive forecast (last year's inflation rate) is included in equation (3) to replace the Livingston series so that the three-way test employed by BG is preserved. Here the hypotheses that the naive and time-series forecasts are conditionally efficient relative to the Michigan survey are strongly rejected while the hypothesis that the Michigan survey is conditionally efficient cannot be rejected. Equation (4) shows that the same conclusion holds for a two-way conditional efficiency test.

These results demonstrate that the Michigan survey measure of the inflation expectations of households dominates a single ARIMA time-

a 4 For a description of this testing procedure and an illustration of its use in this context see Brown and Maital (1981) or Bryan and Gavin (1986b).

series forecast. This finding implies that such forecasts are not appropriate proxies for household inflation expectations in quarterly econometric models. Another interesting implication follows from the observation that the generated forecast used here makes use of the CPI data for the survey month, that is, first-quarter forecasts use the current February value of the CPI, second-quarter forecasts the May value, and so on. The fact that this information is not officially published until more than a month after the Michigan survey is taken, together with the finding that the Michigan survey is conditionally efficient relative to this forecast implies that households are not dependent on published indexes for information on prices and inflation.

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