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Economic Letter

Survey-Based Forecasts Identify Likely Inflation Outcomes

by Antonella Tutino

ABSTRACT: Professional forecasters generally better predict inflation than household surveys and often outperform naïve year-ahead forecasts based on the Fed's 2 percent target. Constants, the basis of the naïve forecasts, benefit because they are not subject to month-to-month volatility.

Central bankers, concerned with where inflation is headed, search for indicators that will aid their real-time decisions. Forecasts based on the forces shaping price pressures should theoretically provide useful insight.

For instance, if people expect higher prices in the future, they are more likely to accelerate purchases to avoid the loss of purchasing power of their noninflation-indexed wealth—holdings such as conventional time deposits.

This higher demand could increase price pressures and push inflation above the central bank's target. Similarly, when inflation expectations are well-anchored, people are less likely to change their spending behavior because demand-side price pressures seem limited.

The Federal Reserve utilizes survey-based inflation expectations, generally available monthly or quarterly.[1] These gauges appear to have outperformed other indicators of inflation expectations based on market measures, often derived from prices for government bonds and related instruments.[2]

The interest-rate-setting Federal Open Market Committee (FOMC) has identified a long-term inflation target of 2 percent. As such, the figure is a useful "naïve" benchmark against which to measure inflation expectations. For example, how well do various forecasts predict inflation one year ahead, and to what degree are they more accurate than assuming a naïve constant rate?

The analyses here suggest that during and following the Great Recession, surveys based on professional forecaster outlooks better predicted inflation than ones relying on a panel of household sentiments. A naïve approach using a constant that attempts to mimic the FOMC's inflation goal, meanwhile, marginally outperformed professional forecasters on headline inflation but less successfully predicted underlying inflation.

Assessing Inflation

The FOMC has generally looked at the personal consumption price index (PCE) as its favored inflation measure since 2012 and the one primarily used to measure whether the 2 percent goal has been reached.[3] The PCE attempts to broadly measure changes in the price of a basket of goods and services consumed by households. The widely watched consumer price index (CPI) also attempts to measure price changes, measuring costs for urban households. Because of differing measurement techniques and baskets of goods and services, PCE and CPI often vary.

In addition to the headline PCE or CPI, economists consider underlying price trends in core inflation—a measure that excludes often-volatile energy and food components (*Chart 1*).

In recognition that differing measures of inflation may indicate different inflation rates, two naïve forecasts are used as barometers. A 2 percent constant—consistent with the Fed target rate—provides a benchmark for predictions of PCE measure. Alternatively, owing to differences between PCE and CPI inflation over time, it seems reasonable that a second constant—of 2.3 percent—should provide a useful benchmark against which to measure headline CPI inflation.[4,5]

There is variability among the four measures—core and headline PCE and core and headline CPI—between first quarter 2008 and second quarter 2015 (*Chart 1*).[6] These gauges reflect the higher volatility of headline inflation relative to core inflation. Moreover, during the period that headline inflation trended lower, core inflation remained stable.

A comparison of surveys of professional forecasters with constants is mixed. Professional forecasters are marginally better than the constants at predicting core CPI and PCE inflation. This is likely because core inflation is more persistent and less volatile than headline inflation.[7]

When inflation is low and relatively stable—as it has been following the Great Recession—the anchoring of expectations, together with errors in predicting volatility of inflation measures, appear to favor constant predictors over professional forecasters with regard to headline measures.

Survey-Based Forecasts

Four surveys were used as metrics of inflation expectations: the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters (SPF), the Surveys of Consumers from the University of Michigan, the Livingston Survey (also from the Philadelphia Fed) and the Blue Chip Economic Indicators. As previously indicated, the results were reviewed from first quarter 2008 to second quarter 2015. Most surveys ask respondents to predict headline CPI inflation (*Chart 2*).

The SPF uses a group of private-sector economists to forecast inflation—quarterly, median one-year-ahead inflation expectations predictions are shown. Unlike other surveys that only look at CPI, the SPF has also produced forecasts for PCE inflation since first quarter 2007.

One-year-ahead inflation predictions for PCE and CPI (both headline and core) are constructed using a geometric average of quarter-over-quarter inflation growth forecasts.[8] The SPF is compared with actual values of quarter-average, year-over-year CPI and PCE rates (*Table 1*).[9]

The University of Michigan survey records monthly inflation forecasts of households, rather than professionals, focusing on anticipated headline CPI inflation. The Michigan survey's predictions, taken from the last observation of the quarter, are compared with actual end-of-quarter, year-over-year CPI headline growth.[10]

The Livingston Survey is conducted twice a year, in June and December, querying economists from government, industry, banking and academia. They are asked to predict inflation 14 months ahead and, thus, the median inflation level forecast is adjusted by a factor of 12/14. Livingston forecasts are comparable to end-of-quarter, year-over-year CPI headline growth.

Finally, Blue Chip Economic Indicators collect expectations of headline CPI from a pool of business economists. Blue Chip forecasts quarterly average CPI headline inflation, same as the SPF and, thus, can also be compared with the CPI headline index.

Comparing Outlooks

The accuracy of each measure is determined by looking at the difference between forecast and realized inflation. Quantifying the difference among the forecasts and realized inflation provides an indication of which type of measure is most accurate. Specifically, the root mean squared forecast error is used—the difference between a forecast and realized inflation, squared (so that positive and negative deviations are equally assessed) and then averaged.

It is easy to demonstrate that the root mean squared forecast error rises with an increase in the variance of the forecast error or with an increase in the squared bias of the error from a value of zero.

In addition to headline CPI and core CPI, headline and core PCE are examined.

Table 1 shows the relative errors of each survey and the naïve models. The lower the error, the closer a forecast is to realized CPI and PCE, respectively. Two naïve models—one 2.3 percent, the other 2 percent—are depicted as proxies for the two inflation measures. (For purposes of this analysis, PCE of 2 percent and CPI of 2.3 percent are both considered to be

Chart 1 Differing Measures Paint a Varied Picture of Actual Inflation

Percent, year-over-year inflation
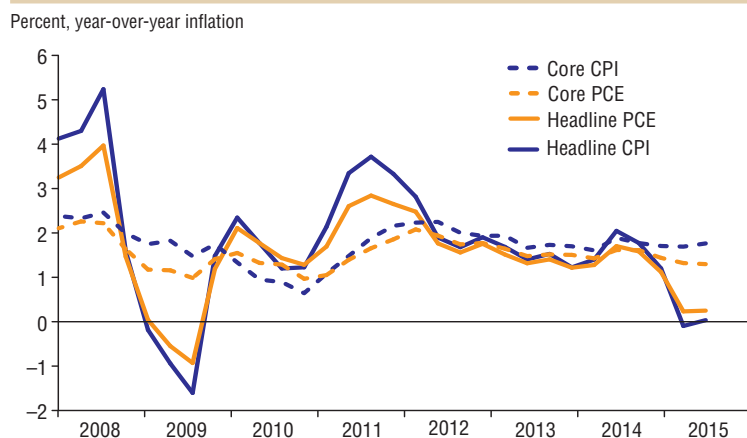
SOURCES: Bureau of Labor Statistics; Bureau of Economic Analysis; Federal Reserve Bank of Dallas.

Chart 2 — Survey-Based and Constant Forecasts of Headline Inflation Overestimate Actual CPI

Percent, year-over-year inflation*
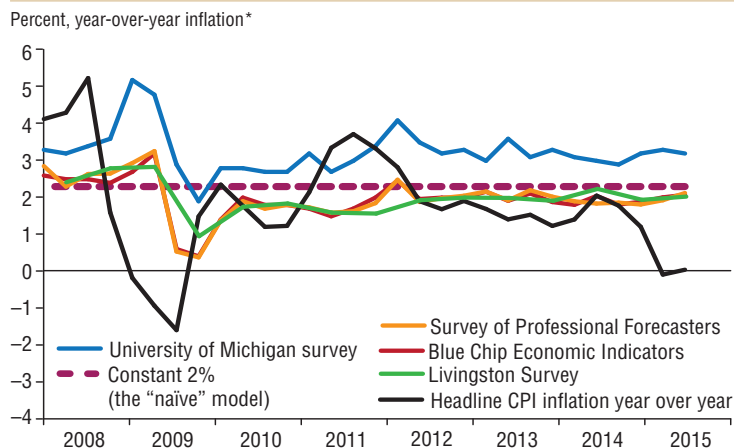
*Headline CPI: year-over-year percent inflation; SPF and Blue Chip: one-year-ahead forecast of year-over-year percent inflation using geometric average of quarterly average inflation forecasts; Michigan and Livingston: one-year-ahead forecast of end-of-quarter year-over-year percent inflation.

SOURCES: Bureau of Labor Statistics; author's calculation.

consistent with the Fed's 2 percent inflation target.) The analysis assumes that the central tendency for core and headline inflation is the same.

First, consider headline CPI: Professional forecasters—SPF, Blue Chip and the Livingston Survey—better predict this than the University of Michigan poll of households. This result probably is due to the superior knowledge and expertise about price fluctuations of participating economists, drawn from business, academia and banking.

However, the naïve forecasts perform marginally better on CPI than the professionals. The average inflation predicted by the forecasts is around 2 percent, while average actual inflation was 1.8 percent. The upward bias may be due to forecasters placing too little weight on the impact of the most recent developments on headline CPI inflation. The 2.3 percent naïve model, therefore, overestimates average observed inflation by even more, 0.5 percentage points, but ends up doing a better job at predicting inflation

because, by construction, it is free of the volatility that bedevils the forecasts—sometimes higher, other times lower—than actual inflation.

Similarly, the naïve 2 percent model, also not subject to volatility, beats SPF forecasts in predicting headline PCE inflation. The actual average PCE for the period was 1.6 percent while SPF's average is 1.8 percent. Although the naïve model also overestimates the realized average headline PCE inflation, the smoothness of the constant provided it the forecasting advantage.

Next, consider core CPI and core PCE inflation for which the SPF is superior to the naïve models. This is seen in a plot of the SPF, the 2.3 percent and 2 percent constants, and actual core CPI and core PCE (*Chart 3*).

Why does the SPF forecast for core CPI beat the constants? First, volatility is less of a factor for this smoother inflation indicator. Second, the average forecast comes closer to the actual average core CPI, while the 2.3 percent naïve model overestimates it by 0.5 percentage points. For similar reasons, the SPF outperforms the 2 percent naïve model on core PCE inflation over the study period.

Improving Forecasts

Professional forecasters outperformed households in predicting headline inflation. They also did better than the households and constants when it comes to predicting core inflation—both PCE and CPI. Yet, the professionals didn't fare as well against naïve models on headline inflation—both PCE and CPI—leaving room for improvement.

There are two sources of weakness in headline inflation forecasts: "excess volatility" of predictions and upward bias in predicting the average headline inflation. In periods of high uncertainty—such as the Great Recession and its aftermath—survey participants' implicit anchoring of headline inflation expectation to the 2 percent mark, compounded by errors in forecasting headline volatility, led to the naïve models' relatively favorable performance. Upward bias in headline inflation forecasts appears less severe for core inflation measures.

Making forecasters more mindful of their tendency to overpredict average

Table 1 — Constants and SPF Forecasts Share Lowest Forecast Error

Forecast errors of year ahead, year-over-year inflation metrics, first quarter 2008–second quarter 2015*

	Prediction method	CPI*** (end of period)	CPI† (avg.)	Core CPI† (avg.)	PCE† (avg.)	Core PCE† (avg.)
Survey-based	Survey of Professional Forecasters (SPF)	**	1.5865	0.4132	1.2212	0.4275
	University of Michigan	2.4626	**	**	**	**
	Livingston Survey	1.7444	**	**	**	**
	Blue Chip	**	1.5805	**	**	**
Naïve models	Naïve model 1: constant 2% forecast	n.a.	n.a.	n.a.	1.155	0.5610
	Naïve model 2: constant 2.3% CPI	1.6471	1.5619	0.7623	n.a.	n.a.

*Sample determined by availability of SPF forecasts for personal consumption expenditures (PCE) measures.

**Entries are left blank if survey is not designed to predict the corresponding inflation metric.
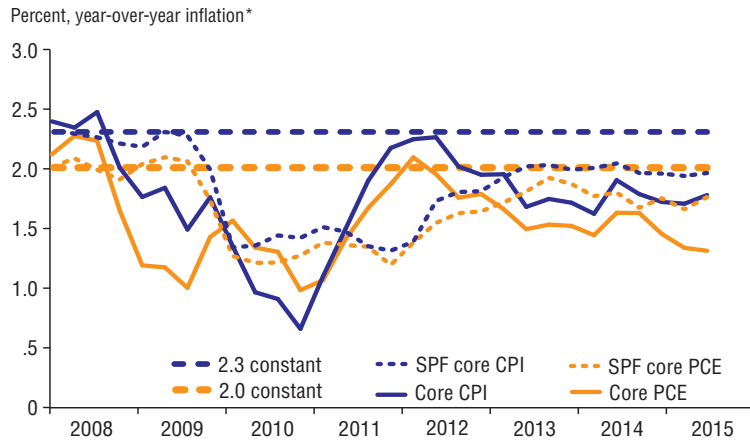
***Uses end-of-quarter, year-over-year inflation predictions and realized inflation.

†Uses quarterly average year-over-year inflation predictions and realized inflation.

n.a.–not applicable.

NOTE: Figures shown are root mean squared forecasts errors. The lowest value in each column (highlighted in red) is the smallest forecast error and, thus, the best predictor of inflation.

Chart 3 — SPF Forecasts Better at Predicting Core Inflation than Naïve Models

Percent, year-over-year inflation*

Legend:
- 2.3 constant
- 2.0 constant
- SPF core CPI
- Core CPI
- SPF core PCE
- Core PCE

*Core CPI and PCE: year-over-year percent inflation; SPF: one-year-ahead forecast of year-over-year percent inflation using geometric average of quarterly average inflation forecasts.

SOURCES: Bureau of Labor Statistics; author's calculation.

headline inflation might improve the accuracy of headline inflation forecasts, the data suggest.

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Notes

[1] See transcript of Chair Janet Yellen's Federal Open Market Committee press conference, Dec. 17, 2014, and "The New Normal Monetary Policy" speech, Federal Reserve Bank of San Francisco, March 27, 2015.

[2] See "Survey Measures of Expected Inflation and the Inflation Process," by Bharat Trehan, *Journal of Money, Credit and Banking*, vol. 47, no.1, 2015, pp. 207–22, and "Do Macro Variables, Asset Markets, or Surveys Forecast Inflation Better?" by Andrew Ang, Geert Bekaert and Min Wei, *Journal of Monetary Economics*, vol. 54, no. 4, 2007, pp. 1163–1212.

[3] See Federal Open Market Committee statement, Jan. 25, 2012. www.federalreserve.gov/newsevents/press/monetary/20120125c.htm.

[4] The topic is explored in "Inflation Measures, Taylor Rules, and the Greenspan–Bernanke Years," by Yash P. Mehra and Bansi Sawhney, Federal Reserve Bank of Richmond *Economic Quarterly*, vol. 96, no. 2, 2010, pp.123–51.

[5] See "Can We Rely on Market-Based Inflation Forecasts," by Michael D. Bauer and Erin McCarthy, Federal Reserve Bank of San Francisco *FRBSF Economic Letter*, no. 30, 2015.

[6] The choice of the starting point is determined by the Survey of Professional Forecasters initiation of forecasts for headline and core PCE in first quarter 2007.

[7] See "Forecasting Inflation," by Jon Faust and Jonathan H. Wright, in *Handbook of Economic Forecasting*, vol. 2A, Graham Elliott and Allan Timmermann, eds., Amsterdam: North–Holland, 2013, pp. 3–56.

[8] Since we consider one-year-ahead inflation expectations, inflation expectations reported for first quarter 2008, for example, are taken from the geometric average of inflation expectations reported in second quarter 2008, third quarter 2008, fourth quarter 2008 and first quarter 2009.

[9] For PCE data, the latest-vintage realization is used.

[10] The comparison is employed since Michigan is forecasting specifically 12 months ahead, rather than quarterly average inflation.