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Economic Letter

Getting a Jump on Inflation

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ABSTRACT: Accurate official estimates of Fed policymakers' preferred PCE inflation measure take months, and sometimes years, to become available. A small set of timelier indicators offers real-time power to "nowcast" PCE inflation. Those indicators provide as much accuracy as initial government estimates and remain informative even after official estimates have been published.

Obtaining timely and accurate inflation readings is of great importance to Federal Reserve policymakers, who are charged with maintaining long-run price stability and who often cite inflation developments in explanations of their actions. Unfortunately, timeliness and accuracy often conflict.

In this article, we discuss how to combine the information in our most timely inflation indicators to anticipate movements in policymakers' preferred inflation gauge, the personal consumption expenditures (PCE) chain price index. The analysis shows that one need not wait for official PCE inflation estimates from the U.S. Bureau of Economic Analysis (BEA) to get an accurate read on inflation. Moreover, the earliest official PCE inflation estimates should not be taken at face value. Recent low inflation readings will likely be revised upward.

Timeliness vs. Accuracy

The Fed's longer-run price-stability goal is annual inflation of 2 percent as measured by the headline PCE chain price index. The PCE price index has several advantages over the more-familiar Consumer Price Index (CPI): It is more responsive to shifting spending patterns, covers a broader range of expenditures and is revised as improved data and measurement methodologies become available.

Analysts pay particular attention to 12-month PCE inflation: There's more "signal to noise" in 12-month inflation than in one-month or quarterly inflation, and shifting seasonal patterns are not an issue.

The greater sophistication of the PCE inflation gauge comes at a price in timeliness: The initial PCE inflation estimate is available roughly two weeks after the CPI inflation report, and the initial estimate is subject to revision months—even years—after the fact. So, there's a risk that policy actions based in part on PCE inflation will appear inappropriate in retrospect.

For example, current-vintage estimates of 12-month PCE inflation rates in the middle of the 2001–07 expansion suggest inflation exceeded the Fed's 2 percent longer-run objective by more than initial estimates had indicated (*Chart 1*). And during the Great Recession that followed, neither the depth nor the rapidity of inflation's decline was fully captured in real time.

In absolute value, PCE inflation revisions have averaged 0.17 percentage points over the past 16 years and have been as large as 0.84 percentage points. Revisions can be persistent, too: Inflation today appears higher than initially estimated over most of the seven-year span from 2010 to 2016.

An important question is whether early government inflation estimates should be taken at face value. Are data available beforehand that might allow one to successfully second guess government statisticians? In addressing this question, we assume that "true" inflation is observed in PCE price index data that have undergone at least three revisions, including at least one annual revision.

Early Inflation Information

Several indicators of U.S. price movements are released well ahead of the PCE price index and are not vulnerable to ex post revision. Besides CPI inflation, these alternative indicators include Institute for Supply Management (ISM) surveys of U.S. manufacturing and nonmanufacturing firms and Federal Reserve Bank surveys of district manufacturing firms.[1] Importantly, the regional Federal Reserve Banks publish their survey results in advance of the ISM, the ISM publishes in advance of the CPI release, and the CPI publishes in advance of PCE inflation.

For example, June 2017 regional Fed surveys were all available by June 27; the ISM manufacturing and non-manufacturing surveys were released July 3 and July 6, respectively; the CPI was released July 14, and the first estimate of PCE inflation was released Aug. 1.

The New York, Philadelphia, Richmond, Kansas City and Dallas Feds each conduct monthly surveys of prices paid by manufacturers in their districts.[2, 3] Rather than consider each regional Fed index separately, we obtain a single summary measure of price pressures using principal component analysis (PCA), which identifies common variation in a set of indicators. Essentially, this analysis is designed to separate the "signal" in the group of indicators from the idiosyncratic "noise."[4]

The PCA-based aggregate of the regional Fed prices-paid indexes moves closely with the ISM manufacturing price index, which is based on a national survey and, thus, ought to reflect price changes in the national economy (*Chart 2*).

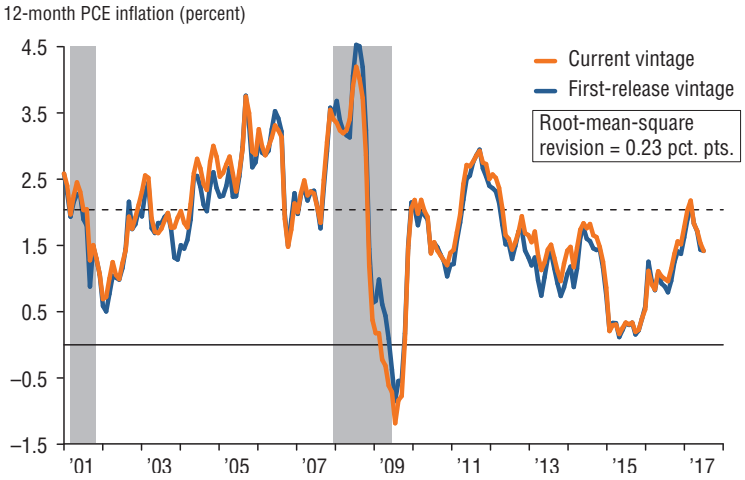
Based on typical release dates for all the price indicators, seven nested information sets are considered when predicting "true" 12-month PCE inflation (*Table 1*).

Predicting Inflation

Table 2 shows which measures are useful for predicting PCE inflation as the amount of information available expands. "Yes" denotes an indicator with significant marginal predictive power. "No" says that an indicator is one of a set of indicators that is jointly insignificant at the 10 percent level, meaning we have reasonable confidence that the "no" assessment is not the result of mere chance.

The aggregate Fed prices-paid index has useful information when no other current-period indicator is available, line 1 of the table shows. Moreover, when the Fed index and the ISM manufacturing price index are both available (line 2), only the Fed index has predictive power. However, when the ISM non-manufacturing report is released, its price

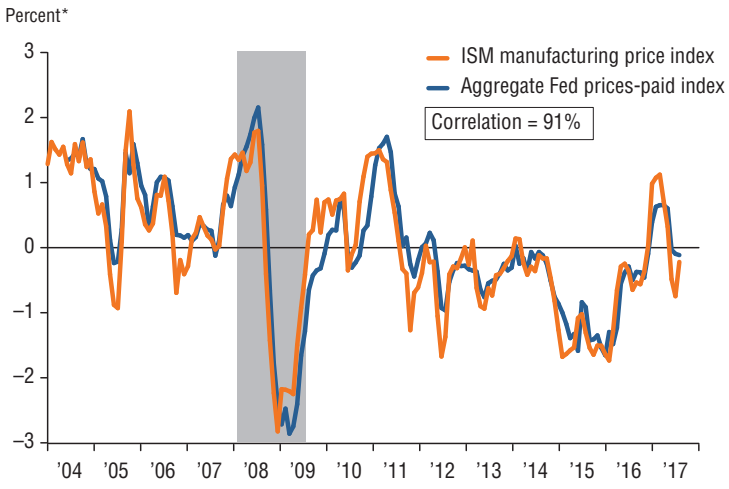
Chart 1 Revisions to 12-Month PCE Inflation Can Be Large, Persistent



NOTES: PCE refers to personal consumption expenditures. Shaded bars indicate U.S. recessions. Dashed line represents the Federal Open Market Committee's 2 percent inflation target. The root-mean-square error is calculated over 2001–16.

SOURCES: Bureau of Economic Analysis; FRED database, Federal Reserve Bank of St. Louis (real-time data); National Bureau of Economic Research.

Chart 2 Fed Prices-Paid Index and ISM Manufacturing Price Index Send Similar Signals



*Calculated for each indicator by subtracting the sample mean and dividing by the sample standard deviation.

NOTES: Shaded bar indicates U.S. recession. The aggregate Fed prices-paid index is the first principal component of regional Federal Reserve Banks' prices-paid indexes.

SOURCES: Institute for Supply Management (ISM); National Bureau of Economic Research; authors' calculations.

Table 1 Chronology of Inflation Information

I.0 = Prior month's PCE inflation data
I.1 = I.0 + PCA-based aggregate prices-paid index, using Fed surveys of manufacturers
I.2 = I.1 + ISM manufacturing price index
I.3 = I.2 + ISM nonmanufacturing price index
I.4 = I.3 + CPI inflation
I.5 = I.4 + First-release current PCE inflation
I.6 = I.5 + Third-release current PCE inflation

Earlier availability ↓ Later

NOTE: PCE is personal consumption expenditures, ISM is the Institute for Supply Management and CPI is the Consumer Price Index. PCA refers to the statistical procedure known as principal component analysis.

index is statistically significant, while the aggregate Fed prices-paid and ISM manufacturing price indexes are jointly insignificant (line 3).

The release of CPI inflation renders the ISM manufacturing and non-manufacturing price indexes irrelevant but not the aggregate Fed prices-paid index (line 4).

Uniquely, the aggregate Fed prices-paid index possesses marginal predictive power even in the presence of first- or third-release PCE inflation (lines 5 and 6). The weights the regression places on the first- and third-release 12-month rates are both roughly 0.92, and both weights are significantly below 1 in statistical tests. Thus, Federal Reserve survey data capture pertinent information not included in preliminary PCE inflation data.

Chart 3 shows the root-mean-square errors of the forecasts that would have been made from December 2009 to February 2017 when relying on each of the information sets I.0 through I.6 to predict "true" 12-month PCE inflation. The errors—in which smaller figures indicate greater accuracy—are plotted against the number of days from the release of the initial PCE report.

When the Fed prices-paid index is available (information set I.1), forecast performance improves relative to the baseline of simply using the prior month's PCE inflation data (I.0): The root-mean-square error falls from 0.21 to 0.19 percentage points. The release of the ISM manufacturing price index (I.2) provides no further performance improvement, while its ISM non-manufacturing counterpart (I.3) does. The most dramatic drop in forecast error occurs with the release of the CPI report (I.4) about two weeks before the initial PCE report (I.5).

When the initial PCE report arrives, forecast performance improves somewhat, but the third estimate released two months later (I.6) yields no further error reduction. Notably, the biggest reductions in root-mean-square error occur prior to the first release of PCE inflation, with zero gains thereafter.

Predicting Inflation Revisions

Also of practical interest is how forecast errors obtained using several indicators in combination compare to using *only* first-release or *only* third-release 12-month PCE inflation to predict "true" inflation. Taking the PCE first release at face value would have resulted in a root-mean-square error of 0.15 percentage points (not shown), while taking the third release at face value would have produced a forecast error of 0.13 percentage points (also not shown). According to Chart 3, neither result improves on what can be achieved using the combined information available in the CPI and Fed survey reports (I.4), both of which are available weeks earlier than the PCE releases.

Thus, a small set of advance indicators has proven quite helpful for predicting 12-month PCE inflation before each release of the PCE price index. In particular, regional Fed prices-paid indexes, the ISM non-manufacturing price index and one-month CPI inflation each appear to have predictive power at some point

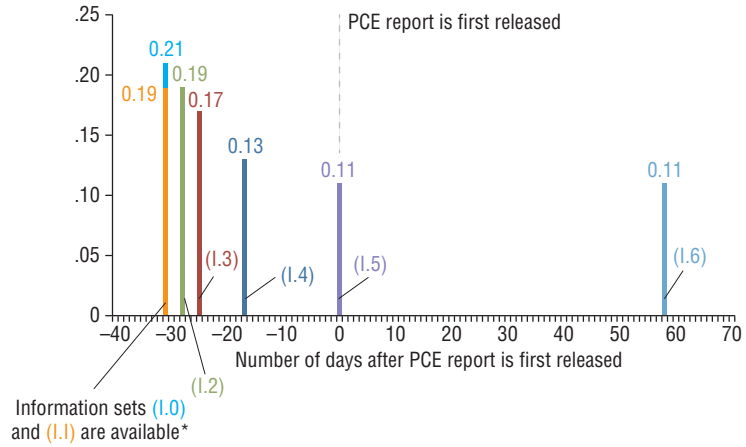
Table 2 Which Indicators Are Helpful for Forecasting 'True' Inflation?

	Indicator							
Information set	Aggregate Fed prices-paid index	ISM manufacturing price index	ISM non-manufacturing price index	One-month CPI inflation	One-month PCE inflation, first release	12-month PCE inflation, first release	One-month PCE inflation, third release	12-month PCE inflation, third release
I.1	**Yes****	–	–	–	–	–	–	–
I.2	**Yes****	No	–	–	–	–	–	–
I.3	No	No	**Yes****	–	–	–	–	–
I.4	**Yes****	No	No	**Yes****	–	–	–	–
I.5	**Yes****	No	No	**Yes****†	**Yes****†	**Yes****	–	–
I.6	**Yes****	No	No	No	–	–	No	**Yes****

NOTES: Rows with information sets I.1–I.4 represent a least-squares regression of the once-annually-revised (and no less than thrice revised) 12-month PCE inflation rate on the listed set of indicators, along with a constant and the first-release one-month lag of the 12-month PCE inflation rate and the 12-month lag of the one-month PCE inflation rate (taken from the same vintage as the one-month lag and with its marginal effect set to –1). Rows with information sets I.5 and I.6 represent a regression with a constant and the listed set of indicators. Dashes denote that an indicator was not included in that row's regression. "Yes" denotes statistical significance at the 5 (**) level for the marginal effect of the corresponding indicator. "No" denotes that an indicator is one of a set of indicators in a row that is jointly insignificant at the 10 percent level. The sample period for all regressions is June 2004 to March 2017. (†) denotes that the one-month CPI and PCE inflation rates' marginal effects were individually statistically insignificant but jointly highly significant, symptomatic of high correlation between the two inflation measures.

Chart 3 Forecast Accuracy Improves as More Data Become Available

Root-mean-square error (percentage points)



*Information set I.0 = prior month's PCE report; I.1 = I.0 + aggregate Fed prices-paid index; I.2 = I.1 + ISM manufacturing price index; I.3 = I.2 + ISM non-manufacturing price index; I.4 = I.3 + one-month CPI inflation; I.5 = I.4 + current-month PCE report; I.6 = I.4 + third-release PCE report.

NOTES: Based on timing relative to the June 2017 PCE report. Negative days indicate the information set is available before the report, while positive days indicate it arrives after. Errors are relative to once-annually-revised (and no less than thrice revised) 12-month PCE inflation, and the root-mean-square errors are calculated over the period December 2009, when real-time data begin, to February 2017. Regressions behind the forecasts correspond to those in the rows of Table 2.

SOURCE: Authors' calculations.

during the month leading up to the first official estimate of PCE inflation.

The PCE inflation "nowcasts" obtained by combining information from the CPI report with Fed survey results are competitive with government statisticians' first and third direct estimates of PCE inflation, which aren't available until much later. Indeed, Fed survey results remain helpful even after the government's early PCE inflation estimates have been published: They help predict revisions to those early government estimates.

Closing In on Price Stability

The BEA estimated April 2017 PCE inflation at 1.72 percent (as of August 2017) and June 2017 PCE inflation at 1.42 percent. Based on Fed survey results, it's likely these figures will be revised higher—to 1.90 percent and 1.55 percent, respectively—at the next annual revision in summer 2018. Thus, the economy may be closer to the Federal Reserve's definition of price stability than is commonly believed.

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Notes

[1] On CPI inflation, see "Nowcasting U.S. Headline and Core Inflation," by Edward S. Knotek II and Saeed Zaman, Federal Reserve Bank of Cleveland, Working Paper no. 14-03R, November 2015. Few regional Feds conduct surveys of non-manufacturers, and those that do didn't begin until recently.

[2] For a closer look at the various regional Fed surveys, see "Fed Manufacturing Surveys Provide Insight into National Economy," by Emily Kerr, Pia Orrenius, Jack Wang and Jesús Cañas, Federal Reserve Bank of Dallas *Economic Letter*, vol. 9, no. 12, 2014.

[3] The Richmond Fed survey takes a different form than the other regional Fed indexes, so it was dropped from the analysis. The aggregate Fed prices-received index offers no predictive power beyond its prices-paid counterpart; hence, it is excluded from the analysis.

[4] Real-time PCA estimates begin in December 2009. Over the full sample beginning in June 2004, the first principal component accounts for roughly 93 percent of the variation in regional Fed prices-paid indexes.

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