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# Core Inflation as a Predictor of Total Inflation[1]

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## Introduction

Among the most highly anticipated economic indicators released each month is the consumer price index (CPI), which measures the prices paid by urban consumers for a representative basket of goods and services.[2] As discussed in Blinder and Reis (2005), one of the innovations of the Greenspan era was a shift in focus for monetary policymakers and the markets from so-called headline, or total, inflation to so-called core inflation, which excludes the food and energy components. One rationale for using core inflation rather than total inflation as a guide to the underlying inflation rate is that the food

[1] The views expressed here are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Philadelphia or of the Federal Reserve System.

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[2] The CPI is released by the U.S. Department of Labor's Bureau of Labor Statistics and is available on the BLS website at www.bls.gov/cpi/home.htm.

and energy components tend to be more volatile from month to month than other components. To the extent that movements in these components are not lasting, including them yields a noisier signal about the underlying inflation rate to which monetary policymakers should be attuned.[3] Another, related rationale is that core inflation may be a better predictor of total inflation and, therefore, a better guide for monetary policymakers, who, given the lags in monetary policy's effect on the economy, need to be forward looking when setting policy.

In this note, we provide some evidence about the two rationales. First, we examine the volatilities of the food and energy components of inflation relative to the volatilities of core and total inflation. Second, we extend and update the analysis of Blinder and Reis (2005), which indicates that current core inflation is a better predictor of future total inflation than is current total inflation itself. In particular, Blinder and Reis's sample ends in March 2005, and we update it through December 2005. We also examine the performance of additional measures of inflation in forecasting future total inflation, including CPI inflation less energy, monthly personal consumption expenditures (PCE) inflation, monthly core PCE inflation, the Federal Reserve Bank of Cleveland's weighted median CPI, and the Federal Reserve Bank of Dallas's trimmed-mean PCE. Our work is related to a large literature that investigates the prediction of total inflation by core inflation. Cogley (2002) discusses the rationales behind various measures of core inflation and proposes and evaluates several as predictors of medium-run inflation. See also Rich and Steindel (2005), Clark (2001), and Smith (2004) for recent studies and reviews of the literature.

**Volatility of the Components of the CPI**

A long-held rationale for focusing on core inflation – that is, inflation less food and energy – as a measure of the underlying inflation rate is the belief that the food and energy components of total inflation have high month-to-month volatility. This high volatility might reflect large relative price changes, which are unrelated to trend inflation. If so, total inflation, which includes these components, could give false signals about underlying trend inflation. But do these components exhibit more

[3] See Motley (1997) for further discussion.

volatility?[4]

The growth rate of the CPI is a benchmark measure of inflation in the U.S. economy. To calculate the price level, the BLS collects price data in 87 urban areas, surveying approximately 50,000 housing units and approximately 23,000 retail establishments.[5] These 87 urban areas, incidentally, cover approximately 87 percent of the nation's population, including individuals both in the labor force and not in the labor force. Prices, including directly associated taxes, are collected for a representative sample of all goods and services purchased for consumption. Prices are not collected for "investment items," such as stocks, bonds, real estate, and life insurance. Since the CPI is released monthly, prices of fuels and a few select items are surveyed each month in all 87 locations, but prices of other goods and services are collected every month in only the three largest locations (New York, Los Angeles, and Chicago) and every other month elsewhere.

To determine the CPI for all items, the BLS takes a weighted average of the price levels of the individual items for which it has collected prices. Weights for this calculation are derived from the Consumer Expenditure Survey. Table 1 lists the weights or "relative importance" currently in use for various components of the CPI; these weights are based on surveys from 2003 and 2004.[6] Table 2 lists the relative importance of a number of special groupings of goods and services. Expenditures on food account for 13.9 percent of the expenditures on all items in the CPI bundle, and expenditures on energy account for 8.7 percent. These items are removed to create the "all items less food and energy" grouping – that is, core CPI – which accounts for 77.4 percent of the total CPI bundle.

Table 3 presents the monthly volatility of inflation as measured by the total CPI, core CPI, food component, energy component, and other components and special indexes over the period August 1987 through December 2005. Our measure of volatility is the standard deviation of the monthly percentage change in the index.

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[4] We thank Joel Naroff of Naroff Economic Advisors for suggesting we examine this issue.
[5] This description of the CPI is based on information from the BLS website. In particular, see www.bls.gov/news.release/cpi.nr0.htm, www.bls.gov/gov/cpi/cpiovrvw.htm, and www.bls.gov/cpi/cpifaq.htm.

[6] For further information about relative importance in the CPI and the Consumer Expenditure Survey, see www.bls.gov/cpi/cpi_riar.htm.

As seen in the table, energy prices exhibit substantial volatility – over 10 times as much as the total CPI when volatility is measured by standard deviation. This is consistent with Blinder and Reis's (2005) finding that the real price of oil from 1970 to 2004 has shown no upward trend and that oil-price shocks over this period have tended to reverse themselves. Food prices also exhibit higher month-to-month variation than the total CPI and substantially less than energy prices. However, price of other components, such as apparel, transportation, and commodities, exhibit higher volatility than do food prices.

Note that deleting volatile components does not necessarily result in an index that is less volatile than the whole because of potentially offsetting co-movements among the components. For example, excluding food and energy yields an index with less month-to-month variation than that of the total CPI (exhibiting about 58 percent as much). In contrast, excluding only food from the CPI results in an index that shows more volatility than the total CPI, even though food is more volatile than the total CPI. Excluding energy alone yields an index with slightly less volatility than the core and about 55 percent as much volatility as that of the total CPI. These results suggest that in addition to core inflation, looking at inflation less energy might be of interest for those trying to obtain a measure or predictor of underlying inflation.[7]

Looking at more finely disaggregated components of the CPI, Clark (2001) also finds that the CPI less energy is less volatile than the CPI. He argues that it is reasonable to include food prices in a measure of core inflation for two reasons. First, inflation in the "food away from home" subcomponent of the CPI is very stable: Its volatility from 1967 to 1997 was 3.7 percent (as measured by the standard deviation of annualized monthly changes in the level). Second, the relative importance and the volatility of the "food at home" subcomponent have declined over the past 30 years.

**Predictors of Total Inflation**

If core inflation is found to be a better predictor of future total inflation, this supports the case for

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[7] There might be other reasons to omit food prices, e.g., some food prices are regulated prices rather than market prices.

focusing on core inflation. We extend the work of Blinder and Reis (2005), who examine whether core or total inflation is a better predictor of future inflation. Two differences between our work and theirs are: (1) we update the sample period – Blinder and Reis's sample ended in March 2005 and ours ends in December 2005; and (2) we investigate a richer set of monthly inflation indicators: While Blinder and Reis investigate the predictability of total CPI inflation using core CPI inflation, we look at the predictability of total CPI inflation using core CPI, CPI less energy, and the Cleveland Fed's weighted median CPI; and we look at the predictability of total PCE inflation using core PCE, PCE less energy, and the Dallas Fed's trimmed mean PCE.[8]

***Alternative Inflation Measures***. The Federal Reserve Bank of Cleveland computes a monthly inflation measure called the weighted median CPI.[9] The weighted median CPI eliminates the most volatile components of CPI each month regardless of sector. To compute this measure each month, the Cleveland Fed first multiples the monthly change in each of the 41 components of the CPI published by the BLS by an updated measure of the component's relative importance in the total CPI. This measure of relative importance has been updated according to the formula (as given in Smith, 2004)

$$RI_{t+1}^{i} = RI_{t}^{i}\left(\frac{1+\pi_{t}^{i}}{1+\pi_{t}}\right)$$

where *i* is the CPI component, $\pi_t^i$ is inflation in that component, and $\pi_t$ is total CPI inflation. These weighted changes are then arranged by size, and the median of these price changes is selected. Half of the expenditures in the month are on components whose price changes are smaller than this component's, and half of the expenditures in the month are on components whose price changes are greater than this component's.

The U.S. Department of Commerce's Bureau of Economic Analysis (BEA) publishes the chain-weight price index for personal consumption expenditures (PCE) on a monthly basis. Like the CPI, the

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[8] We thank the BEA for generously sharing with us the monthly data series of PCE less energy.

[9] See Bryan and Cecchetti (1994) and Bryan, Cecchetti, and Wiggins (1997) for a description. Note, though, that the Cleveland Fed calculates the price change for a component as a simple percentage change rather than as a log difference as in these two papers.

PCE proxies the price level faced by consumers, and we can see in Figure 1 that monthly inflation rates computed from the two indices follow similar patterns. However, there are differences between the two series. The CPI is a fixed-weight index, whereas the PCE is a chain-weight index. This means that the CPI is a sum of components weighted by consumer expenditure shares that are determined in an initial period. The PCE is calculated using weights that change over time as consumers change the relative weight of expenditures on the component goods.[10] Thus, it accounts for substitution between goods because of price changes. Additionally, data sources for the CPI and PCE are not exactly the same.

The Dallas Fed computes a trimmed-mean PCE inflation measure based on the component price changes and associated weights as published by the BEA.[11] Like the Cleveland Fed's index, the price changes are ordered from lowest to highest, and 19.4 percent of the weight from the lower tail and 25.4 percent of the higher take are excluded, and then a weighted average of the remaining components is computed. (The amount trimmed from the lower and upper tails is based on historical data and are determined by what results in the best fit between the trim mean measure of inflation and the core PCE inflation rate.)[12]

***Forecasting Model.*** Like Blinder and Reis (2005) we estimate regressions of the form:

$$\pi_{t,t+h} = \alpha + \beta x_{t-12,t} + \varepsilon_{t,}$$

where $\pi_{t,t+h}$ is the percentage change in the total inflation index, y, between months t and t+h (annualized) and $x_{t-12,t}$ is the percentage change in an inflation index, z, over the past 12 months. That is,

$$\pi_{t,t+h} = \left[ \left( \frac{y_{t+h}}{y_t} \right)^{(12/h)} - 1 \right] \times 100 \quad \text{and} \quad x_{t-12,t} = \left( \frac{z_t}{z_{t-12}} - 1 \right) \times 100 .$$

As in Blinder and Reis, we examine the predictability of total inflation over four different forecasting horizons: h = 6 months, 12 months, 24 months, and 36 months, with either the 12-month change in total inflation, the 12-month change in core inflation, or both as the variables on the right-hand

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[10] See Clark (1999).

[11] For a description, see the Dallas Fed's website at www.dallasfed.org/data/pce/descr.html.

[12] See the Dallas Fed's website.

side of the forecasting equation.[13] We examine the accuracy of both in-sample and out-of-sample forecasts. To evaluate the in-sample forecasting accuracy, we report the standard errors of the forecast regression equations estimated using the data from August 1987 through December 2005. To evaluate the out-of-sample forecasting accuracy, we report the root mean squared errors (RMSEs) of the forecasts from January 1996 through December 2005 that are generated from estimating the forecasting equation using the data from August 1987 through December 1995.

**Results**

Tables 4 to 6 present the results on forecasting total CPI inflation with the three alternative measures of core CPI inflation and Tables 7 to 9 present the results on forecasting total PCE inflation with the two alternative measures of core PCE inflation.

Table 4 presents results that replicate those in Blinder and Reis (2005) but with the longer sample period of data. Our results are nearly identical to theirs and indicate that core CPI is a better predictor of future CPI than CPI itself. As in Blinder and Reis (2005), the use of core CPI as the right-hand-side variable in the forecasting regression leads to smaller out-of-sample RMSEs, smaller in-sample standard errors, and larger multivariate regression coefficients. As they point out, the differences are small at the shorter forecasting horizons. In fact, total CPI performs slightly better than core CPI at the 6-month horizon as measured by the out-of-sample RMSE, and total CPI performs slightly better at the 6- and 12-month horizons as measured by the in-sample standard error and multivariate regression coefficients. However, core CPI outperforms total CPI by a much larger margin at the longer horizons, which are arguably more relevant for monetary policy.

Focusing on the out-of-sample RMSE results, we see in Table 5 that CPI less energy also performs better than CPI as a predictor of future CPI at the longer forecasting horizons. However, CPI less energy does not predict future CPI quite as well as core CPI does. The Cleveland Fed's measure (Table 6) does not perform as well as core CPI or CPI less energy. In fact, it appears superior to the CPI

[13] For example, future CPI inflation in July 2002 over the 6-month horizon is the annualized percentage change in the CPI from July 2002 to January 2003.

itself only at the longest horizon, and this difference is not substantial (0.61 to 0.67).

Turning to the PCE, Table 7 shows, based on the out-of-sample performance, that unlike the case with the CPI, core PCE is not a better predictor of PCE than the PCE itself. This difference between the results for the CPI and PCE reflects less that the core PCE is a poor predictor of total PCE and more that the total PCE is a good predictor of future total PCE. Note that the RMSEs for total CPI's predicting future total CPI range from 1.12 at the 6-month horizon down to 0.67 at the 36-month horizon, whereas the RMSEs for total PCE's predicting future total PCE range from 0.86 at the 6-month horizon down to 0.61 at the 36-month horizon. Table 8 shows that PCE less energy does not outperform total PCE except at the 36-month forecasting horizon, at which the difference in out-of-sample RMSEs is small (0.57 for PCE less energy compared to 0.61 for total PCE). Table 9 indicates that total PCE is a better predictor of future total PCE than is the Dallas Fed's trimmed mean at the shorter forecasting horizons of 6 and 12 months, but that the Dallas Fed's measure is superior at the 24-month and, in particular, the 36-month horizon. Thus, none of the alternative measures is a clearly superior predictor of total PCE inflation.

***Comparison to Other Results in the Literature.*** Other papers have examined the forecasting ability of alternative core inflation measures for future total inflation. These include Cogley (2002), Rich and Steindel (2005), Clark (2001), and Smith (2004), among others. The findings differ across the studies, reflecting differences in the inflation measures, forecasting models, and time periods used. In general, researchers find that some type of alternative CPI measure is better at predicting future total CPI than is total CPI, but the particular alternative measure differs across the studies. The PCE has been studied less in the literature, and there does not appear to be a consensus regarding forecast performance.

Cogley (2002) proposes an adaptive measure of core inflation that allows for changes in mean inflation due to changes in policy regimes. This measure is approximated by a simple exponentially smoothed function of inflation. Based on in-sample fit, Cogley concludes that the exponentially smoothed measure is a better predictor of total CPI inflation than the core, median core CPI, or trimmed mean.

Rich and Steindel (2005) examine the CPI and the PCE and several alternative measures of each, including exponentially smoothed measures as in Cogley (2002). Their prediction model, which differs slightly from ours, is:

$$\pi_{t+h} - \pi_t = \alpha_h + \beta_h(\pi_t - \pi_t^{CORE}) + \varepsilon_{t+h}$$

where $\pi_{t+h}$ is the annualized $h$-quarter-ahead inflation rate with $h$ corresponding to the forecasting horizon, $\pi_t$ is the current annualized quarterly inflation rate, and $\pi_t^{CORE}$ is the current annualized alternative inflation rate. They do not look at total inflation's ability to predict future total inflation as we do (following Blinder and Reis), but they do look at the out-of-sample RMSEs of forecasts of total inflation using various alternative measures of inflation.

Rich and Steindel find that no single alternative measure of inflation performs better than the rest at predicting future total inflation; the best predictor varies across sample periods and forecasting horizons. Our out-of-sample prediction results for the PCE and its alternatives are consistent with those of Rich and Steindel – there is no clear best performer. But our results for the CPI differ. We find that the CPI less food and energy is a better forecaster of total CPI than is CPI less energy at all forecasting horizons, and we find that both of these are clearly superior to the weighted median CPI.[14] In contrast, Rich and Steindel find that the weighted median gives the best forecast performance at longer forecast horizons.

Clark (2001) estimates the same model as Rich and Steindel, which differs slightly from ours, using CPI and its less volatile alternatives; he does not study the PCE. He compares the in-sample forecasting performance using regression R-squared goodness-of-fit measures; he does not compute out-of-sample RMSEs.[15] He runs regressions using two different sample periods (1967-2000 and 1985-2000) and two forecasting horizons (12 months and 24 months). With the longer sample, he finds that only CPI less energy has statistically significant predictive power of total CPI at the 12-month forecasting horizon. It is also the best predictor at the 24-month forecasting horizon, but the trimmed mean CPI and median CPI are also statistically significant predictors at this forecasting horizon. All alternative CPI measures are found to be statistically significant in the shorter sample regressions. The CPI less energy is the best

[14] In addition to using a different forecasting model and sample period, we measure total inflation by the monthly 12-month percentage change, while Rich and Steindel use the quarterly percentage change.

forecaster at the 12-month forecasting horizon, while the median CPI is the best at the 24-month forecasting horizon.

Clark's shorter sample period is closest to the sample period we studied, and our findings are consistent with Clark's in that the in-sample standard error for the 12-month forecasting horizon is the smallest when the CPI less energy is used. However, we find that CPI less energy continues to show the best forecasting performance when the forecasting horizon is extended to 24 months. In contrast, Clark finds that the median CPI is the best in this case. Additionally, Clark's overall results for the short sample suggest that core CPI is the weakest of all the candidates in terms of predictive power; we find that it is the strongest.

Smith (2004) evaluates several alternative inflation measures as predictors of both the CPI and the PCE on the basis of out-of-sample RMSEs using monthly data from January 1982 through June 2000. Among several models, she finds the best performing model is an exponential decay model of the form,

$$\pi_{t,t+h} = x_{t-1,t} + \beta x_{t-2,t-1} + \beta^2 x_{t-3,t-2} + \ldots + \beta^{24} x_{t-25,t-24} + \varepsilon_{t+h}$$

where $\pi_{t+h}$ is the annualized $h$-quarter-ahead inflation rate with $h$ corresponding to the forecasting horizon, $x$ is the alternative inflation rate for the specified month in the past, and the $\beta$ coefficients sum to one. Smith finds that the median CPI outperforms the CPI, the trimmed mean CPI, and the core CPI as a predictor of future CPI.[16] She also finds that median PCE outperforms the PCE and the core PCE as a predictor of future PCE.

**Conclusions**

Policymakers that have an inflation goal might be better off being guided by a measure of inflation that excludes components that exhibit sharp changes in relative prices that are unrelated to changes in underlying inflation. Such a measure might yield better predictions of future total inflation. There are several alternatives for such a measure. Because of the volatility of energy prices, measures

[15] Clark does not compare the forecasting performance of the alternative measures with that of total inflation itself.

that exclude the energy component tend to be less volatile than total inflation measures. The most popular core inflation measure drops both the food and energy components. This actually produces a series that demonstrates slightly more volatility than a measure that omits the energy components only and retains the food components.

Nonetheless, we find that core CPI inflation (i.e., total CPI less food and energy) performs better as an out-of-sample predictor of total CPI inflation than the total CPI, the CPI less energy, and the Cleveland Fed's weighted median CPI. The CPI less energy was a close second in terms of predicting future total CPI inflation. This suggests that even if policymakers have total CPI inflation in their loss function, they might want to focus on core CPI inflation rather than total CPI inflation over short time horizons. Based on our results, we cannot make a similar conclusion for the PCE because, in contrast to the CPI, we find that total PCE is its own best predictor.

We note, however, that the results on inflation prediction vary considerably across studies, depending on the forecasting model, time period, and measures of inflation used. Thus, we cannot conclude that one particular alternative measure of inflation does a substantially better job at predicting inflation across all time horizons or sample periods.

[16] Smith uses the "research series" for the CPI and core CPI, which is available upon request from the BLS. The research series controls for changes in the methodology used to construct the CPI by computing the pre-January 1998 index using the method that has been in use since January 1998.

**Table 1. CPI Relative Importance Weights by Expenditure Category, as of December 2005 (in percent)**

| Index | Relative Importance |
|---|---|
| Total | 100.000 |
| Food and beverages | 15.051 |
| Food | 13.942 |
| Housing | 42.380 |
| Fuels | 4.494 |
| Apparel | 3.786 |
| Transportation | 17.415 |
| Motor fuel | 4.191 |
| Medical care | 6.220 |
| Recreation | 5.637 |
| Education and communication | 6.047 |
| Other goods and services | 3.463 |

Source: U.S. Department of Labor, Bureau of Labor Statistics, www.bls.gov/cpi/cpiri_2005.pdf.

**Table 2. CPI Relative Importance Weights of Special Indexes and Groupings as of December 2005 (in percent)**

| Index | Relative Importance |
|---|---|
| All items | 100.000 |
| All items less energy | 91.315 |
| All items less food | 86.058 |
| All items less food and energy | 77.373 |
| Services | 59.210 |
| Services less energy services | 55.055 |
| Commodities | 40.790 |
| Commodities less food | 26.848 |
| Commodities less food and energy commodities | 22.319 |
| Nondurables | 29.214 |
| Nondurables less food | 15.272 |
| Energy | 8.685 |
| Energy commodities | 4.530 |

Source: U.S. Department of Labor, Bureau of Labor Statistics, www.bls.gov/cpi/cpiri_2005.pdf.

**Table 3. Monthly Volatility in Inflation of Components of the CPI**

Standard deviation of monthly percentage changes in each index, from August 1987 through December 2005.

| | Weight | Standard Deviation | Standard Deviation as % of Standard Deviation of All Items |
|---|---|---|---|
| CPI-U: All Items | 100.000 | 0.2083 | 100.0 |
| CPI-U: All Items Less Food and Energy | 77.373 | 0.1215 | 58.3 |
| CPI-U: All Items Less Food | 86.058 | 0.2311 | 110.9 |
| CPI-U: All Items Less Energy | 91.315 | 0.1136 | 54.5 |
| CPI-U: Food | 13.942 | 0.2520 | 121.0 |
| CPI-U: Energy | 8.685 | 2.2219 | 1066.8 |
| CPI-U: Food and Beverages | 15.051 | 0.2323 | 111.6 |
| CPI-U: Housing | 42.380 | 0.1484 | 71.3 |
| CPI-U: Apparel | 3.786 | 0.4894 | 235.0 |
| CPI-U: Transportation | 17.415 | 0.9090 | 436.4 |
| CPI-U: Medical Care | 6.220 | 0.1733 | 83.2 |
| CPI-U: Other Goods and Services | 3.463 | 0.5152 | 247.4 |
| CPI-U: Commodities | 40.790 | 0.4345 | 208.6 |
| CPI-U: Services | 59.210 | 0.1244 | 59.8 |

**Table 4. Forecasting Future Total CPI: Total CPI vs. Core CPI**

| | Forecasting horizon | | | |
|---|---|---|---|---|
| | 6 months | 12 months | 24 months | 36 months |
| **Out-of-sample root mean squared error** | | | | |
| Core CPI | 1.15 | 0.93 | 0.74 | 0.43 |
| Total CPI | 1.12 | 0.98 | 0.87 | 0.67 |
| Both | 1.07 | 0.96 | 0.82 | 0.58 |
| **In-sample standard error** | | | | |
| Core CPI | 1.10 | 0.93 | 0.78 | 0.64 |
| Total CPI | 1.09 | 0.92 | 0.81 | 0.71 |
| Both | 1.08 | 0.91 | 0.77 | 0.64 |
| **Multivariate regression coefficients and standard errors (in parentheses)** | | | | |
| Core CPI | 0.27 | 0.27 | 0.41 | 0.58 |
| | (0.12) | (0.10) | (0.10) | (0.09) |
| Total CPI | 0.37 | 0.33 | 0.10 | −0.07 |
| | (0.12) | (0.10) | (0.09) | (0.08) |

Note. The forecasting equation is of the form $\pi_{t,t+h} = \alpha + \beta x_{t-12,t} + \varepsilon_{t,}$ where $\pi_{t,t+h}$ is future total inflation over time horizon t to t+h, and $x_{t-12,t}$ is either the 12-month change in core inflation, in total inflation, or both in the multivariate case. The out-of-sample root mean squared errors are those of forecasts from January 1996 through December 2005 generated from forecasts estimated using data from August 1987 through December 1995. The in-sample standard error is the standard error of the regression equation estimated with data from August 1987 through December 2005. The bottom panel shows the coefficients and their standard errors of the forecasting equation that includes both total and core inflation on the right-hand side and estimated using data from August 1987 through December 2005.

**Table 5. Forecasting Future Total CPI: Total CPI vs. CPI Less Energy**

| | Forecasting horizon | | | |
|---|---|---|---|---|
| | 6 months | 12 months | 24 months | 36 months |
| **Out-of-sample root mean squared error** | | | | |
| CPI Less Energy | 1.15 | 0.94 | 0.76 | 0.47 |
| Total CPI | 1.12 | 0.98 | 0.87 | 0.67 |
| Both | 1.71 | 1.09 | 0.80 | 0.45 |
| **In-sample standard error** | | | | |
| CPI Less Energy | 1.07 | 0.89 | 0.75 | 0.63 |
| Total CPI | 1.09 | 0.92 | 0.81 | 0.71 |
| Both | 1.07 | 0.89 | 0.75 | 0.63 |
| **Multivariate regression coefficients and standard errors (in parentheses)** | | | | |
| CPI Less Energy | 0.46 | 0.48 | 0.61 | 0.75 |
| | (0.14) | (0.12) | (0.11) | (0.10) |
| Total CPI | 0.21 | 0.15 | −0.07 | −0.21 |
| | (0.13) | (0.11) | (0.10) | (0.09) |

See note to Table 4.

**Table 6. Forecasting Future Total CPI: Total CPI vs. Cleveland Fed Weighted Median CPI**

| | Forecasting horizon | | | |
|---|---|---|---|---|
| | 6 months | 12 months | 24 months | 36 months |
| **Out-of-sample root mean squared error** | | | | |
| Cleveland | 1.38 | 1.16 | 0.91 | 0.61 |
| Total CPI | 1.12 | 0.98 | 0.87 | 0.67 |
| Both | 2.06 | 1.45 | 0.96 | 0.64 |
| **In-sample standard error** | | | | |
| Cleveland | 1.15 | 0.97 | 0.80 | 0.65 |
| Total CPI | 1.09 | 0.92 | 0.81 | 0.71 |
| Both | 1.09 | 0.91 | 0.78 | 0.65 |
| **Multivariate regression coefficients and standard errors (in parentheses)** | | | | |
| Cleveland | 0.20 | 0.25 | 0.44 | 0.62 |
| | (0.14) | (0.12) | (0.11) | (0.10) |
| Total CPI | 0.49 | 0.42 | 0.23 | 0.10 |
| | (0.09) | (0.08) | (0.07) | (0.06) |

See note to Table 4.

**Table 7. Forecasting Future Total PCE: Total PCE vs. Core PCE**

| | Forecasting horizon | | | |
|---|---|---|---|---|
| | 6 months | 12 months | 24 months | 36 months |
| **Out-of-sample root mean squared error** | | | | |
| Core PCE | 0.98 | 0.81 | 0.85 | 0.70 |
| Total PCE | 0.86 | 0.73 | 0.74 | 0.61 |
| Both | 0.99 | 0.72 | 0.79 | 0.68 |
| **In-sample standard error** | | | | |
| Core PCE | 0.86 | 0.72 | 0.63 | 0.55 |
| Total PCE | 0.87 | 0.72 | 0.67 | 0.61 |
| Both | 0.85 | 0.70 | 0.63 | 0.55 |
| **Multivariate regression coefficients and standard errors (in parentheses)** | | | | |
| Core PCE | 0.43 | 0.37 | 0.48 | 0.60 |
| | (0.13) | (0.11) | (0.10) | (0.10) |
| Total PCE | 0.33 | 0.35 | 0.13 | −0.05 |
| | (0.13) | (0.11) | (0.10) | (0.09) |

See note to Table 4.

**Table 8. Forecasting Future Total PCE: Total PCE vs. PCE Less Energy**

| | Forecasting horizon | | | |
|---|---|---|---|---|
| | 6 months | 12 months | 24 months | 36 months |
| **Out-of-sample root mean squared error** | | | | |
| PCE Less Energy | 0.92 | 0.75 | 0.76 | 0.57 |
| Total PCE | 0.86 | 0.73 | 0.74 | 0.61 |
| Both | 1.22 | 0.80 | 0.79 | 0.57 |
| **In-sample standard error** | | | | |
| PCE Less Energy | 0.84 | 0.69 | 0.62 | 0.55 |
| Total PCE | 0.87 | 0.72 | 0.67 | 0.61 |
| Both | 0.84 | 0.69 | 0.62 | 0.54 |
| **Multivariate regression coefficients and standard errors (in parentheses)** | | | | |
| PCE Less Energy | 0.62 | 0.55 | 0.65 | 0.79 |
| | (0.15) | (0.13) | (0.12) | (0.12) |
| Total PCE | 0.16 | 0.20 | -0.02 | −0.20 |
| | (0.15) | (0.12) | (0.12) | (0.11) |

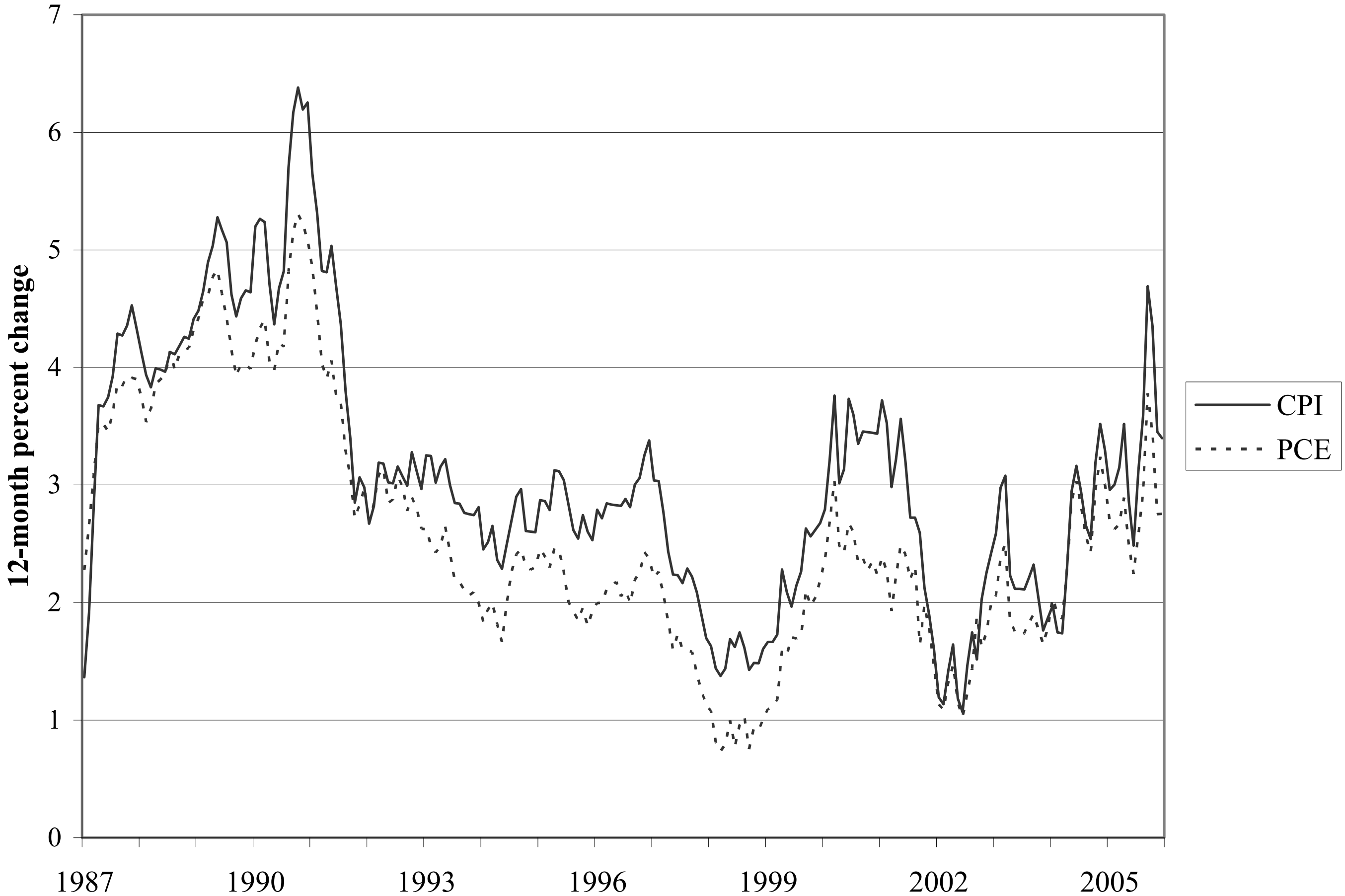
See note to Table 4.

**Table 9. Forecasting Future Total PCE: Total PCE vs. Dallas Fed Trimmed-Mean PCE**

| | Forecasting horizon | | | |
|---|---|---|---|---|
| | 6 months | 12 months | 24 months | 36 months |
| **Out-of-sample root mean squared error** | | | | |
| Dallas | 0.96 | 0.82 | 0.78 | 0.52 |
| Total PCE | 0.86 | 0.73 | 0.74 | 0.61 |
| Both | 1.61 | 1.30 | 1.03 | 0.70 |
| **In-sample standard error** | | | | |
| Dallas | 0.86 | 0.70 | 0.62 | 0.50 |
| Total PCE | 0.87 | 0.72 | 0.67 | 0.61 |
| Both | 0.86 | 0.69 | 0.62 | 0.47 |
| **Multivariate regression coefficients and standard errors (in parentheses)** | | | | |
| Dallas | 0.62 | 0.67 | 0.88 | 1.49 |
| | (0.19) | (0.16) | (0.16) | (0.13) |
| Total PCE | 0.30 | 0.25 | −0.02 | −0.48 |
| | (0.14) | (0.12) | (0.11) | (0.09) |

See note to Table 4.

**Figure 1. CPI and PCE**




Monthly Data

Source: BLS, BEA, and Haver Analytics

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