Outline proposal for what is core inflation?

Fed communications extensively reference core inflation. Forward guidance has occasionally referenced numerical economic objectives, and these have been cast in terms of core PCE (and unemployment) and it is fairly standard to use core PCE as the inflation measure in a Taylor rule (Blinder and Reis, 2005). Of course the concept of core that is being considered here is always ex food and energy but there are different core measures that can be considered, and that is the subject of the proposal.

There are two ways in which I think of core inflation. The first is that while the Fed ultimately cares about all inflation, core is useful as a forecast of actual future headline inflation. This is often the way in which the Fed talks about it (e.g. Powell (2022)). This might arise if non-core components were iid noise that did not pass through into future core inflation. The second is that even if the Fed had foresight of future headline inflation, they might choose to react to core instead, because headline might be influenced by supply or cost-push that the central bank would prefer to look through. Throughout I am focussing on PCE rather than CPI because it is preferred by the Fed owing to it broader coverage and more frequent reweighting.

In the first part of the proposed paper, I take the first perspective that core should be a forecast of future headline. It is is closely related to the criterion that a core measure should not be excessively volatile at high-frequency (Ball et al., 2021). Thus, the first part of the proposed paper considers various candidate core PCE inflation measures and assess their properties as predictors of future headline PCE inflation and how it has varied over time. The candidate core measures include:

1. PCE ex food and energy, commonly referred to as core.
2. PCE ex food, energy and housing.
3. PCE services ex energy and housing, highlighted in some Fed communications (e.g. Powell (2022)).
4. Trimmed mean PCE (Dolmas, 2005).
5. Median PCE.
6. Winsorized mean PCE. Winsorizing PCE is something that I haven't seen done, but it seems a good idea. What this means is that for the observations in (say) the top 24 percent of the distribution, they are not dropped but simply set to the value for the 24th percentile. This greatly mitigates the problem with the trimmed mean that it gets mechanically dominated by housing.

I am aware of many papers that have studied the performance of core as a predictor of future headline (Bryan and Cecchetti, 1994; Clark, 2001; Rich and Steindel, 2005; Smith, 2004; Crone et al., 2013). Apart from the newer dataset and the use of the winsorized mean PCE, one distinct feature of what I am proposing here is studying core measures as direct forecasts of future headline without any parameter estimation. In contrast, most of the existing work has proposed exercises like regressing future headline on current core. That would imply that a particular linear function of

core inflation is a good predictor, but unless the slope is 1 and the intercept is 0, it doesn't imply that core itself is directly a good forecast. It could, for example, be biased. The way that central bankers discuss core seems to me to imply that core is itself a good predictor.

In preliminary work, I have constructed the various measures of PCE core back to 1959. In some cases, such as trimmed PCE, this involved redoing the underlying calculations to go further back in time. Table1 shows the root mean square errors of different inflation measures (including headline) from month $t-h$ to t as predictors of headline inflation from month t to $t+12$ for different choices of $h = 1, 3, 6, 12$. The Ecumenical method–averaging over all measures and all horizons–as suggested by Jason Furman is also included. The conclusions are that excluding food and energy is a good idea when looking at short h but doesn't really help with $h = 12$. The winsorized mean is also a competitive core measure and in fact gives the lowest root mean square error of all the individual measures. But the most important result from Table 1 is that the Ecumenical method gives the best prediction of future headline inflation. This is rather striking, although it is yet another manifestation of the forecasting folklore that equal weighted averaging of forecasts is stunningly hard to beat (Bates and Granger, 1969; Smith and Wallis, 2009; Claeskens et al., 2016).

The relevance of different inflation measures for forecasting future headline may have changed over time, for example as the weight on energy fell, and that might explain some of the inconsistent results in the literature. We can consider the Fluctuations test of Giacomini and Rossi (2010) which compares two inflation forecasts in rolling 15 year windows. Figure 1 shows the comparison between using headline and CPI ex food and energy as a predictor of future headline inflation at all four horizons. In windows that cover the 1970s, headline inflation did slightly *better* than core inflation as a predictor of future headline inflation. In later rolling windows that reversed although none of the comparisons is significant even at the 10 percent level. Figure 2 shows the comparison between using headline and Ecumenical inflation as a predictor of future headline inflation at all four horizons. Here the comparison is more favorable to the core (Ecumenical) measure. Even in the 1970s, it does not really hurt, and in more recent samples it is better and the improvement gets close to significance at the 10 percent level.

A closely related but different perspective is that there are various statistical measures of the trend in inflation. An example is the multivariate core trend inflation of the New York Fed (Almuzara and Sbordone, 2025). The idea is that it jointly smooths over the cross-section and time series to extract an underlying trend factor, but it is something of an econometric black box and hard for a central banker to cite directly in communication. A question to ask is which of the potential core measures is closest to the MCT measure (or some such trend variable). Table 2 reports the root mean square difference between different inflation measures over the previous 12 months and the MCT 12 month inflation rate, in percentage points. PCE ex food and energy is the closest of the single measures to MCT, but the Ecumenical measures gets substantially closer still.

Further things to do on the issue of core forecasting future headline include:

(i) Seeing how different measures would have performed if predicting PCE using the weights that apply today.

(ii) Using other model averaging methods to see if there is some way of combining the indices that does better than Ecumencial, while recognizing the simplicity and transparency of the Ecumenical index.

(iii) Doing something about recognizing the effects of data revisions.

Switching instead to the second perspective, the Fed may want to respond differently to demand shocks and temporary cost-push shocks (Blinder and Reis, 2005; Walsh, 2009; Beaudry et al., 2023; Reis, 2022). That brings me to the second way of thinking about core inflation which is inflation that is demand driven or cyclically sensitive. This is a little bit different from saying that core inflation should be a generalized increase in inflation and not a change in relative prices that might impact aggregate inflation because of price stickiness. Reis and Watson (2010) document that pure inflation—defined as equiproportional changes in all sectors—explains little over the overall variance of inflation, and has virtually no relationship with economic slack.

Several indices of cyclically sensitive inflation have been proposed (Mahedy and Shapiro, 2017; Stock and Watson, 2020). I envision a related but slightly different definition of cyclically sensitive inflation. Consider a Phillips curve for inflation in sector i:

$$\pi_{it} = \gamma_{bi}\pi_{it-1} + \gamma_{fi}\pi_t^e + \kappa_i U_t + \varepsilon_{it}$$

where π_{it} is inflation in sector i in quarter t, π_t^e is aggregate expected inflation (say from the Michigan survey) and U_t is the unemployment gap. Cost-push shocks are in the error term ε_{it}. I consider estimating this equation for each sector separately using distributed lags of monetary policy shocks as instruments for U_t following Barnichon and Mesters (2020). Letting the estimated parameters be $\hat{\gamma}_{bi}, \hat{\gamma}_{fi}$ and $\hat{\kappa}_i$, I can define the predicted inflation in the absence of cost-push shocks as:

$$\hat{\pi}_{it} = \hat{\gamma}_{bi}\hat{\pi}_{it-1} + \hat{\gamma}_{fi}\pi_t^e + \hat{\kappa}_i U_t.$$

Then, if the weight on sector i in inflation is ω_i, I construct the overall measure of cyclically sensitive inflation in quarter t as $\Sigma w_i \hat{\pi}_{it}$. I have yet to implement this.

Central banks are unlikely to want to reference something this specific as a measure of core inflation. But the different core inflation measures considered earlier in the proposal could be evaluated in terms of how close they get to this measure of cyclically driven inflation.

Table 1: RMSE of alternative core as predictors of future headline

Predictor	$h=12$	$h=6$	$h=3$	$h=1$
Headline	1.62	1.60	1.78	2.19
Ex Food and Energy	1.64	1.54	1.55	1.76***
Ex Food Energy and Housing	1.66	1.57	1.62	1.91
Services ex energy and housing	1.80***	1.72	1.82	2.25
Trimmed Mean	1.68	1.59	1.56	1.61***
Median	1.71	1.62	1.59	1.66**
Winsorized Mean	1.62	1.53	1.50	1.56***
Ecumenical (All hs)	1.44**			

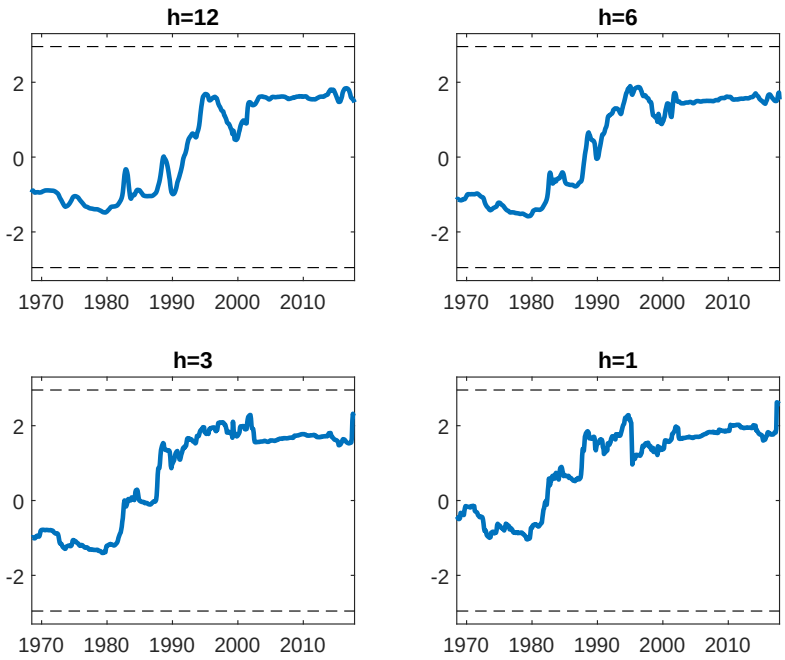
Notes: For each core inflation measure in the left column, this table reports the root mean square prediction error of that measure of PCE inflation from month $t-h$ to month t (annualized), as a predictor of headline PCE inflation from month t to month $t+12$. No parameters are estimated. The sample is from 1960:01 to 2025:04. Two and three asterisks denote significance of the difference between that inflation predictor and the headline inflation predictor at the 5 and 1 percent levels, respectively. The Ecumenical inflation measure averages all 28 other core measures.

Table 2: Root mean square difference between different core measures and MCT

Headline	0.78
Ex Food and Energy	0.64
Ex Food Energy and Housing	0.68
Services ex energy and housing	1.08
Trimmed Mean	0.83
Median	0.87
Winsorized Mean	0.73
Ecumenical (All hs)	0.44

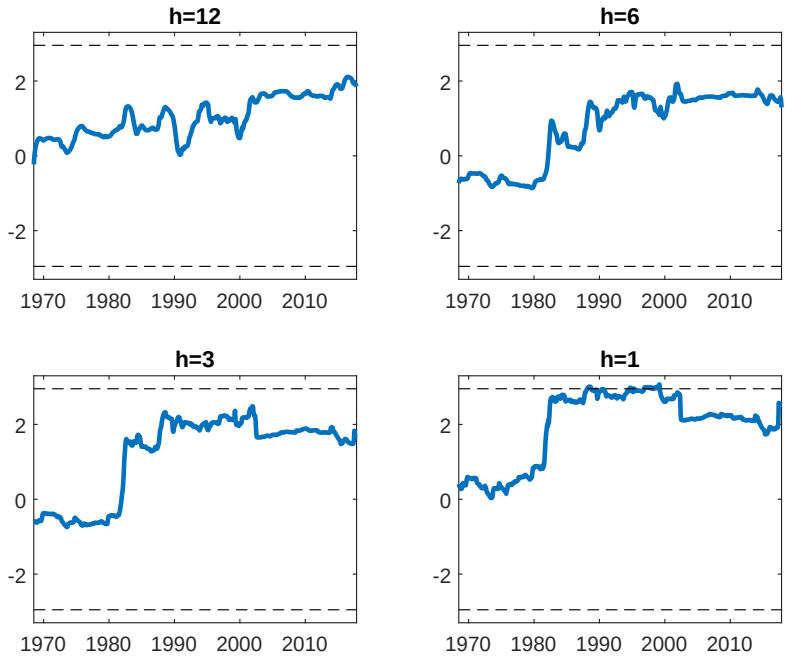
Notes: For each core inflation measure in the left column, this table reports the root mean square difference between that inflation measure and the multivariate core trend of Almuzara and Sbordone (2025). All are at the 12 month horizon, except that the Ecumenical measure combines 1, 3, 6 and 12 month horizons.

Figure 1: Fluctuations test comparing headline and ex food and energy



NOTE: Each subplot of this Figure shows the fluctuations test of Giacomini and Rossi (2010) comparing headline PCE inflation from $t-h$ to t with ex food and energy PCE inflation from $t-h$ to t both exaluated as predictors of headline inflation from t to $t+12$. The sample period is 1960:01 to 2025:04. Rolling windows of length 15 years are shown and results are plotted against the midpoint of the 15 year window. Positive numbers mean that the ex food and energy PCE is better than headline, as a predictor of future headline inflation. Two-sided critical values at the 10 percent significance level, compured as described in Giacomini and Rossi (2010) are shown as dashed horizontal lines.

Figure 2: Fluctuations test comparing headline and Ecumenical



NOTE: Each subplot of this Figure shows the fluctuations test of Giacomini and Rossi (2010) comparing Ecumencial PCE inflation from $t-h$ to t with ex food and energy PCE inflation from $t-h$ to t both exaluated as predictors of headline inflation from t to $t+12$. The sample period is 1960:01 to 2025:04. Rolling windows of length 15 years are shown and results are plotted against the midpoint of the 15 year window. Positive numbers mean that the Ecumencial PCE inflation is better than headline, as a predictor of future headline inflation. Two-sided critical values at the 10 percent significance level, compured as described in Giacomini and Rossi (2010) are shown as dashed horizontal lines.

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