

Speech

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Headline versus Core Inflation in the Conduct of Monetary Policy

In discussing and thinking about the conduct of monetary policy, many central bankers focus on core inflation--that is, a measure of inflation that excludes the rate of increase of prices for certain volatile components in price indexes.¹ The Federal Reserve, for example, pays particular attention to the rate of growth of the core personal consumption expenditure (PCE) deflator, which excludes food and energy prices. Indeed, in the presentation of its twice yearly Monetary Policy Report to the Congress, the Federal Reserve Board reports the projections of Federal Open Market Committee participants regarding core PCE inflation, not headline inflation, the latter of which includes all items in the price index. Here in Canada, unlike in the United States, the central bank maintains an explicit inflation target. The Bank of Canada states its target in terms of the headline consumer price index, and although this choice of inflation measure contrasts with the Federal Reserve's preferred index, the difference is not nearly as great as it appears on the surface. In fact, the Bank of Canada monitors a number of inflation measures and uses core inflation as an "operational guide" in coming to its monetary policy decisions and discussing these decisions with the public.

Does it make sense for a central bank to concentrate on core inflation? After all, households almost daily pay for energy and food items--which are excluded from the most prominent measures of core inflation--when they fill up their cars at gas stations or visit a grocery store. Households, particularly less-affluent households, spend a major portion of their budgets on food and energy. A focus on core inflation, which excludes these items, might be viewed as indicating that monetary policy makers are out of touch with what consumers really care about. Wouldn't it be better for monetary policy authorities to focus on headline inflation so that they include food and energy in their monitoring of consumer price inflation?

As I will argue, this is not an either-or decision. It does indeed make sense for central banks to emphasize headline inflation when determining the appropriate stance of monetary policy over the medium run, but policymakers also are right to emphasize core inflation when deciding how to adjust policy from meeting to meeting. Why? Because what central bankers are truly concerned with--both for the purposes of internal deliberations and for communications with the public--is the underlying rate of inflation going forward, and core inflation can be a useful proxy for that rate. Thus, focusing on core inflation can help prevent a central bank from responding too strongly to transitory movements in inflation.

Why Monetary Policy Should Focus on Core Inflation

Because households care about the prices of all the items they buy, it clearly does not make sense to pretend that people do not eat or drive. Thus, I have no qualm in stating that controlling headline inflation, not core inflation, is--along with maintaining maximum sustainable employment--the ultimate aim of monetary policy. Nonetheless, I will argue that it is still useful for monetary policy makers to focus on core inflation when deciding how to respond to incoming economic news.

Although monetary policy is capable of controlling overall inflation in the long run, it does not have the ability to control relative price movements such as those for food and energy. When a cold snap

freezes the Florida orange crop or a tropical storm hits the gasoline refineries along the Gulf Coast, monetary policy cannot reverse the resulting spikes in prices for fresh orange juice or for gasoline at the pump. Temporary supply shocks such as these raise the prices of food and energy relative to other prices and can have substantial effects on inflation in the short run. By including all items--including particularly volatile items like food and energy--headline measures of inflation are inherently noisy and often do not reflect changes in the underlying rate of inflation, the rate at which headline inflation is likely to settle and that monetary policy can affect.

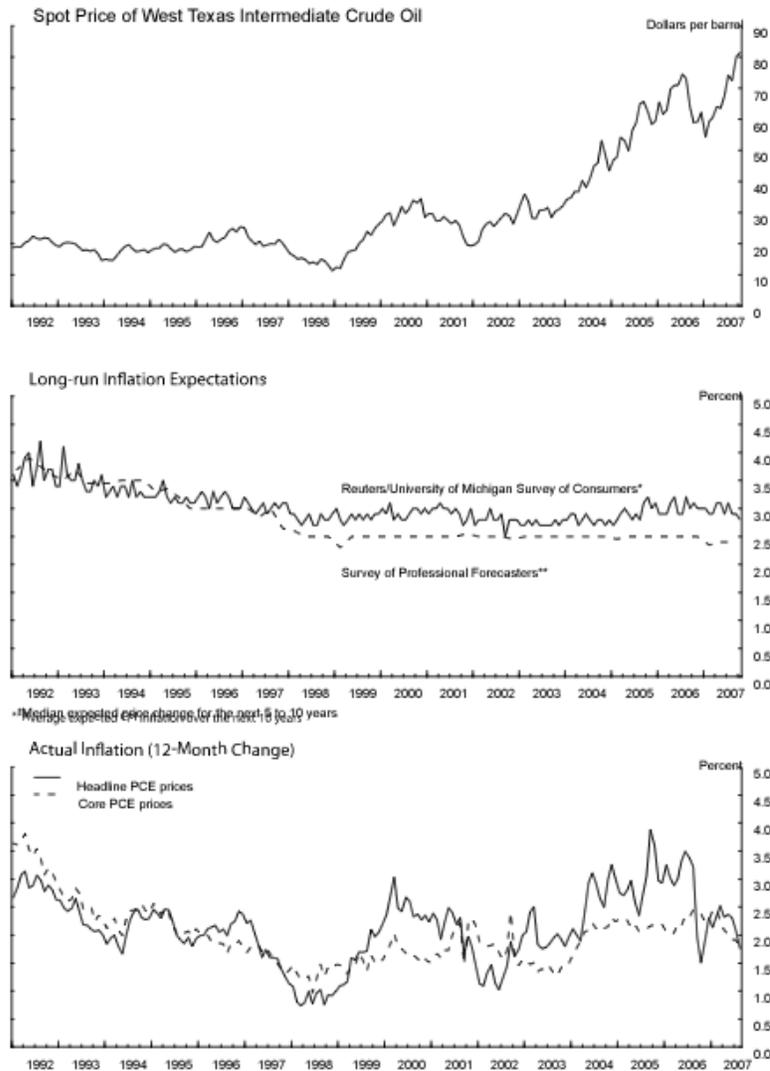
Measures of core inflation attempt to strip out or smooth volatile changes in particular prices to distinguish the inflation signal from the transitory noise. Thus, relative to changes in headline inflation measures, changes in core measures are much less likely to be reversed, provide a clearer picture of the underlying inflation pressures, and so serve as a better guide to where headline inflation itself is heading. Of course, if a particular shock to noncore prices is not temporary but, rather, turns out to be more persistent, then the higher costs are likely to put some upward pressure on core prices. Central bankers must always be aware of this risk. However, research has shown that, over the past twenty-five years or more, headline inflation in the United States has tended to revert more strongly toward core inflation than core inflation has moved toward headline inflation.² As that record suggests, core measures often are much better than headline indexes at providing a first approximation of the permanent changes to inflation.

When headline inflation has an important transitory component, a focus on core measures can help avoid monetary policy mistakes. If the monetary authorities react to headline inflation numbers, they run the risk of responding to merely temporary fluctuations in inflation. We can think about this danger by considering a supply shock, that causes the relative price of energy to increase sharply, as in fact has happened over the past three years. Let us suppose that we start out with both headline and core inflation at acceptably low levels.

First, let's consider a supply shock that temporarily raises the price of energy by a large amount. In this case headline inflation will rise well above its underlying trend as the price of energy rises but will soon fall well below its underlying trend as the price of energy falls back to its initial level. On average, inflation will remain unchanged without any monetary policy action. But a tightening of monetary policy in reaction to the rise in headline inflation would lead to a decline in employment and inflation; and because of the long lags between monetary policy actions and changes in economic activity, that decline would occur some time down the road, when inflation would more likely be at or below its underlying trend. The outcome of such a policy would be a more pronounced fall in inflation with a decline in employment. Such a policy would be bad indeed because it would increase volatility in inflation and employment, which is the opposite of what a central bank should be trying to achieve as it seeks to promote price stability and maximum sustainable employment.

But what if a supply shock leads to a permanent shift in the relative price of energy? Indeed, almost all commentators characterize the current oil price shock that way, in part because they see the rise of new economic powers like China as adding to the demand for energy in the foreseeable future. Although in that case the rise in relative energy prices is not reversed, the *rate of change* in energy prices does not persist: Headline inflation will rise with the increase in energy prices, but once energy prices reach their permanently high level, headline inflation will revert to its underlying trend rate. Thus, as long as the permanent change in relative energy prices does not lead to a change in the *underlying trend rate of inflation*--a crucial assumption--then headline inflation will come back down again. This is what we seem to have seen recently in the United States. From a low near \$30 per barrel in late 2003, the price of oil rose to \$70 per barrel by the middle of 2006, and it has stayed high, with the current price more than \$80. That move increased headline PCE inflation to the 4 percent level for a time, but it has since retreated to around 2 percent ([figure 1](#)).

Figure 1

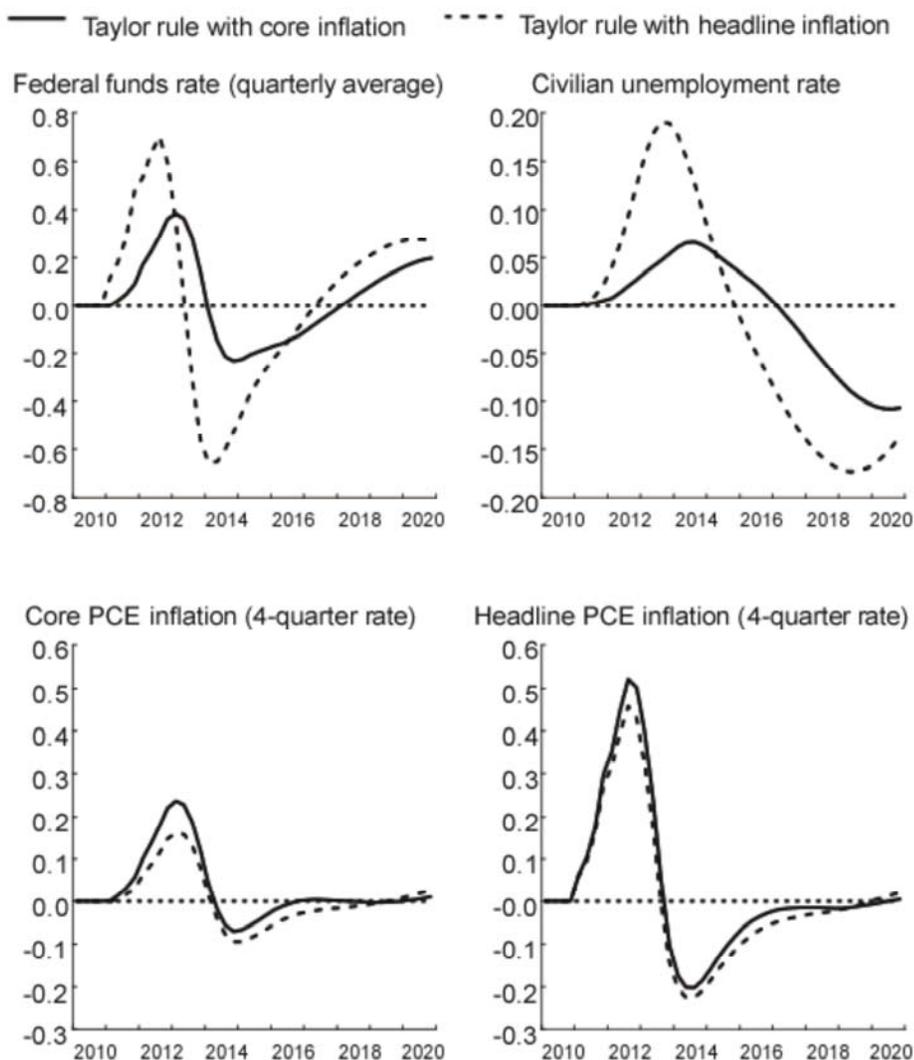


Monetary policy clearly can do little about the first-round effects of a permanent rise in energy prices, which include both its direct impact on the energy component of overall consumer prices and the pass-through of higher energy costs into prices of non-energy goods and services. But policy does have a critical role to play in determining the second-round effects associated with changes in the underlying trend rate of inflation. Such second-round effects are likely to be quite limited as long as the rise in the relative price of energy does not lead to a rise in long-run inflation expectations, as has largely been the case in the recent period (figure 1). However, the stability of expectations rests on the central bank's strong long-term commitment to providing a nominal anchor, which, as I have argued elsewhere (Mishkin, 2007), describes the situation in the United States. With such a commitment firmly established, monetary policy then does not need to respond as much to the temporary rise in headline inflation to stabilize inflation over the longer run. Under these circumstances, if monetary policy is tightened appreciably in the face of a surge in headline inflation, the policy would likely be excessively tight and lead to an unnecessary decline in employment.

Because the point about headline inflation is so important, I would like to illustrate it further with simulations of FRB/US, the model of the U.S. economy created and maintained by the staff at the Federal Reserve Board. To keep the experiments as clean as possible, I assume that the economy begins at full employment and with both headline and core inflation at desired levels. The economy is then assumed to experience a shock that raises the world price of oil about \$30 per barrel over two years; the shock is assumed to slowly dissipate thereafter. In each of two scenarios, a Taylor rule is assumed to govern the response of the federal funds rate; the only difference between the two is that in one scenario the funds rate responds to core PCE inflation, while in the other it responds to headline PCE inflation.³ [Figure 2](#) illustrates the results of these two scenarios. The federal funds rate jumps higher and faster when the central bank responds to headline inflation rather than to core inflation, as would be expected (top-left panel). Likewise, responding to headline inflation pushes the unemployment rate markedly higher than otherwise in the early going (top-right panel), and produces an inflation rate that is slightly lower than otherwise, whether measured by core or headline indexes (bottom panels). More important, even for a shock as persistent as this one, the policy response under headline inflation has to be unwound in the sense that the federal funds rate must drop substantially below baseline once the first-round effects of the shock drop out of the inflation data. Responding to headline inflation is therefore inappropriate because it generates extensive variability in the unemployment rate--variability that is much more subdued when policy responds to core inflation.⁴

Figure 2

Implications of Responding to Core versus Headline PCE Inflation
(Persistent Oil Price Shock with the FRB/US Model, Levels Relative to Baseline)



Of course, the pitfalls associated with reacting to realized headline inflation, as illustrated by this simulation, are well understood. Accordingly, advocates of targeting headline inflation generally have in mind a strategy of responding to *forecasts* of headline inflation--forecasts that try to take account of inflation movements that are likely to be transitory. This is a further illustration of my basic point, namely, that it is important to distinguish between transitory and persistent inflation movements, and focusing on core inflation can help achieve that end.⁵

The focus on core instead of headline inflation--and clear communication with the public about that focus--can have another benefit: It may help anchor inflation expectations when headline inflation increases temporarily but core inflation remains essentially unchanged. If the public understands that the central bank is using core inflation in formulating monetary policy and trusts that the central bank is right to do so, the public will realize that the central bank does not need to respond aggressively to a surge in headline inflation to keep inflation under control. And, with core inflation stable, the public will be less likely to think that the central bank has weakened its commitment to a

strong nominal anchor when it does not tighten monetary policy to stabilize headline inflation. The result is that inflation expectations are likely to remain anchored, which may lead to better outcomes not only on inflation but on employment as well, because the central bank will not have had to tighten monetary policy as much in response to the energy price shock. As I noted earlier, figure 1 offers some support for this view: It shows that the rise in headline inflation in the 2004-06 period, when core inflation remained quite stable, did not lead to an appreciable rise in long-run inflation expectations, even with a substantial decline in unemployment during this period.

Is Inflation Excluding Food and Energy the Best Measure of Underlying Inflation?

The most popular core inflation measures used and published in the United States are quite straightforward: They simply exclude changes in food and energy prices. However, such simple "exclusion" measures can likely be improved upon. For example, many of the food categories excluded in the standard measure of core inflation, such as food away from home (restaurants), are not highly volatile and so likely should remain in an optimal core inflation measure. On the other hand, some items that are not excluded from the U.S. core measures, such as airline fares, tobacco, and apparel, are extremely volatile and thus are unlikely to be included in an optimal core inflation measure.

The Bank of Canada, for example, uses a more targeted approach to its core inflation indicator, the CPIX. Of fifty-four consumer product categories, it excludes eight, which account for about 16 percent of the consumption basket (Macklem, 2001). Most of the eight items are also excluded from the standard core measure in the United States. However, Canada's CPIX also excludes intercity transportation and tobacco, which are included in the U.S. core measures.⁶

Another approach to estimating core inflation measures is statistical, in which certain prices are excluded at each point on the basis of statistical criteria. Among these statistical measures are trimmed indexes, such as the trimmed mean and the weighted median consumer price indexes produced by the Cleveland Fed and the trimmed mean PCE price index produced by the Dallas Fed. Each month, these measures throw out the components with the largest price changes, both positive and negative (though the Dallas measure is asymmetric).⁷

Other approaches to estimating core inflation are theory-based measures employing common trends, unobserved components, or a particular model of the economy.⁸ However, these theory-based approaches tend to be rather complex and require faith that the model they are based on is the right one.

Each of these measures of core inflation can be evaluated according to a variety of criteria, including the ability to forecast headline inflation over some period and the degree of correlation with alternative definitions of trend inflation. According to some of these criteria, statistical and theory-based approaches are sometimes found to outperform simpler exclusion measures of core inflation, like the standard one excluding food and energy. As you can tell, this is an active area of research, but recent research done at the Federal Reserve Bank of New York on U.S. data finds that no one particular core measure, including the standard one, dominates the others: The relative performance of different core measures varies depending on the choice of the price index, the sample period, and the criteria for evaluating their performance (Rich and Steindel, 2007). Research on Canadian and U.K. data comes to similar conclusions (Hogan, Johnson, and Laflèche, 2001; Mankikar and Paisley, 2002).

Does the lack of empirical support for any one particular type of core measure suggest that our focus on the standard core measure should be abandoned? I think not. The simplicity and long history of the standard core measure that excludes food and energy gives it several major advantages. Its simplicity makes it straightforward to explain and thus more understandable to the public--assuming, of course, that we successfully communicate that we recognize the importance of food and energy items in people's consumption. Its simplicity also makes its estimation very transparent. That transparency and the fact that it has been around a long time--hence the characterization as "standard"--both prevent a central bank or a government authority from easily manipulating the

measure to show good results. These features of the standard core measure therefore make it a credible device to keep inflation expectations anchored when supply shocks occur: If the standard measure remains stable, then a surge in headline inflation is less likely to unhinge inflation expectations, which as we have seen can lead to both better inflation and better employment performance.

Why Central Banks Should also Focus on Headline Inflation

Despite the advantages of core measures of inflation, their use in conducting monetary policy has been criticized.⁹ Core measures of inflation attempt to remove the most volatile or transitory components of the inflation measure. But, because the nature of price shocks may change over time, items that have been highly volatile in the past may not be so in the future; hence, any core measure will itself likely be subject to transitory shocks. Unfortunately, as noted above, empirical research suggests that no one measure of core inflation will work in all situations. Therefore, central banks do not focus solely on core inflation; rather, they devote considerable resources to understanding inflation developments in an effort to distinguish signal from noise in the incoming data.¹⁰

Another reason to keep watch over the broader inflation picture is that, if the rate of change in the price of an excluded item receives a permanent shock, then the headline inflation rate can deviate from the core measure for an extended period of time. The longer this period of high headline inflation persists, the greater is the risk of second-round effects as the public begins to build this higher inflation into its expectations. For example, from 1987 to 2002, energy price shocks appear to have been temporary in that energy prices were mean reverting; as a result, in this period, the average difference between core and headline PCE inflation was quite small. Since 2002, however, the effect of energy price shocks have been more persistent, and headline inflation has averaged more than 1/2 percentage point above core inflation over this period. Over the past year, energy prices have about leveled off on balance--or at least that was the case until a couple of weeks ago--and the rate of headline inflation for most of this year has come down close to that for core, one hopes alleviating the risk of second-round effects. But the increases in oil prices in recent days provide another reminder that shocks can persist longer than one might have at first expected.

A prolonged divergence between core and headline measures of inflation could complicate central bank communications with the public because core inflation would require some adjustment before it would provide a clear gauge of underlying inflation. For example, the weighted median CPI inflation rate, one popular measure of core inflation, has tended to be a biased measure of headline inflation. The weighted median is exactly equal to owners' equivalent rent nearly half the time because that component has an extremely large share of the consumption basket and fairly low volatility (Bryan and Pike, 1991; Hogan and others, 2001; and Bryan and Meyer, 2007). However, the productivity growth rate in residential construction is not terribly high, and so this sector is likely to have below-average productivity growth and above-average price increases. Indeed, the weighted median CPI exceeded overall CPI inflation on average by 1/4 percentage point per year over the decade from 1992 to 2002, a period when changes in energy prices were transitory. Of course, to the extent that such a bias in a core inflation measure is stable or predictable, the central bank could easily take this into account in setting monetary policy. But even in that case, differences in average rates of inflation between the core measure and overall inflation could complicate communication with the public.

Conclusion

I have argued that a measure of core inflation that is easily understood and provides some greater signal about persistent movements in inflation than does headline inflation itself is extremely valuable for the conduct of monetary policy, and that is why the Federal Reserve pays so much attention to such measures. However, I have also argued that core measures have their limitations. A single core inflation measure cannot account for all types of shocks and can at times be misleading about what is happening to the underlying rate of *overall* inflation. And if increases in headline inflation prove more persistent than initially expected, central bankers must be vigilant to ensure that they do not become embedded into expectations and thereby generate substantial second-round effects on inflation. Finally, because price stability ultimately involves control of

overall, headline inflation, which after all is the inflation measure that households really care about, central bankers should and do pay attention to headline inflation as well as to core inflation measures. A core inflation measure should not be seen as a substitute for thorough and careful analysis of the forces that are driving our economy and the inflation process.

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Footnotes

1. I thank [Alan Kackmeister](#), Jean-Philippe Laforge, [David Lebow](#), [Deb Lindner](#), and [Robert Tetlow](#) for their comments and assistance. The speech reflects my own views and not necessarily those of others on the Federal Open Market Committee. [Return to text](#)

2. These tests allow for a nonzero constant differential between headline and core inflation. The differential often turns out to be nontrivial and statistically significant. Cogley (2002) uses published CPI over the period from 1967:Q2 to 1997:Q4 and finds that it may take about 8 quarters before there is substantial reversion of headline inflation to core inflation. Clark (2001), using 12-month CPI inflation from 1967 to 2000 finds little reversion over the next 12 months but about 50 percent reversion over 24 months, though that level is still statistically insignificant. In contrast, he finds substantial and statistically significant reversion at both the 12- and 24-month horizons using data from 1985 to 2000. Rich and Steindel (2007) find significant reversion of headline CPI inflation to core CPI inflation over 12 quarters using methodologically consistent CPI data from 1978 to 2004. An earlier version of their work (Rich and Steindel, 2005) showed similar results using PCE price inflation in the 1978-2004 and 1959-2004 periods. Internal work conducted at the Federal Reserve using 15-year rolling-window regressions suggests that the reversion of headline PCE inflation to core PCE inflation has been much stronger in samples that start after the early 1980s and also that the reversion of core inflation to headline inflation has been much weaker in that period.

Results for other countries are more ambiguous. In recent years, Canada appears to have had a similar reversion of headline inflation to their version of core inflation, along with little reversion of core inflation to headline inflation (Laflèche and Armour, 2006; also, Armour, 2006; Hogan, Johnson, and Laflèche, 2001). However, the OECD (2005) has found that many countries show little reversion of headline inflation to core inflation and that, in fact, core inflation often reverts to headline inflation. [Return to text](#)

3. The Taylor rule is written as follows: $R = r^* + \bar{\pi} + (\bar{\pi} - \pi^*) + y$ where $\bar{\pi}$ is the four-quarter inflation rate, either core or headline, π^* is the inflation target, taken to be the baseline inflation rate, and y is the output gap. This specification means that the response coefficients on each gap variable is 1. [Return to text](#)

4. These scenarios were constructed using a rule that assumes no prior knowledge of how long the oil price shock will last. Research done by the staff at the Federal Reserve Board using other types of models also suggests that when the persistence of shocks is uncertain, using core inflation rather than headline inflation in central bank reaction functions can improve policy outcomes (Bodenstein, Erceg, and Guerrieri, 2007). [Return to text](#)

5. Economic theory also suggests an additional argument for focusing on a core measure of inflation. Because some prices are "sticky," meaning they move sluggishly in response to shocks, higher inflation generates greater dispersion of relative prices and, with that, a misallocation of resources. Responding to a core inflation measure, which puts more weight on sticky prices, can

minimize this distortion and promote relative prices that better reflect the true underlying demand and supply conditions in the economy (for example, Aoki, 2001; and Woodford, 2003, chap.

6). [Return to text](#)

6. Canada's CPIX also excludes mortgage interest costs, which are never included in measures of U.S. consumer prices because the prices of owner occupied housing services are measured on a rental equivalence basis in the United States. The other items excluded from the CPIX are fruits, vegetables, gasoline, natural gas, and fuel oil and other fuel. [Return to text](#)

7. Bryan and Cecchetti (1994); Robalo Marques, Duarte Neves, and Morais Sarmiento (2003); Dolmas (2005); Brischetto and Richards (2007); Smith (2004). [Return to text](#)

8. Recent examples include: the common trends approach of Bagliano and Morana (2003), the VAR approach of Quah and Vahey (1995); the unobserved components approach of Doménech and Gomez (2006) and Velde (2006); and the factor-models approach of Cecchetti (1997) and Cristadoro and others (2005). [Return to text](#)

9. Laidler and Aba (2000); Clinton (2006); and Bean (2006) are critical of responding to core inflation; Blinder (2006) argues on the other side. [Return to text](#)

10. More details on inflation forecasting at the Board are in Bernanke (2007). [Return to text](#)

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