

MONETARY POLICY INSIGHTS
POLICY FOCUS



WILL HIGHER ENERGY PRICES BOOST CORE INFLATION?¹

This commentary presents research findings on the degree to which higher energy prices are typically passed through to core consumer prices and on whether the degree of pass-through has changed over time. Such pass-through has been mentioned as a source of upside inflation risk in the recent speeches by FOMC members and in the minutes of the September FOMC meeting. The analysis concludes that, while there is evidence of a significant effect of energy prices on core inflation and long-term inflation expectations before 1987, there does not appear to be any systematic relationship over the more recent period. This research is consistent with MA's recent forecasts in which we assumed there would not be significant pass-through of higher energy prices into core inflation.

In late summer, financial markets focused on the potential inflationary impact of Hurricanes Katrina and Rita. These storms damaged infrastructure of the energy industry in and around the Gulf of Mexico, disrupting the production and distribution of energy throughout the region. As a consequence, prices of crude oil, gasoline, and natural gas shot up quickly, and the corresponding increases in consumer and producer prices are among the biggest ever. This engendered concerns that the recent rise in energy costs might “finally” push through into “core” consumer prices at a time when the underlying inflation rate already had moved into the upper of half of the FOMC’s implicit comfort range. (Both the core CPI and core PCE inflation rates have very recently subsided to levels more comfortably within the implicit comfort ranges for each.)

Developments since the hurricanes have allayed some of these concerns, but the issue of the pass-thru of energy prices into core inflation remains given the sharp and sustained rise in energy costs over the last few years. Consider, for example, the nearby chart, which shows the price of energy goods and services within the chain-type price index for personal consumption expenditures (PCE) relative to corresponding core price level. (We use the PCE price index rather than the Consumer Price Index because the former is preferred by the Fed.) The numerator in this calculation includes consumers’ costs for gasoline, electricity, home heating oil, and natural gas. Since 2002, this real cost of energy has risen by roughly one third, and the recent rate of increase rivals those experienced in the 1970s. Furthermore, prices on contracts for future delivery of energy commodities suggest that participants in these markets expect much of the recent increase to persist for the

¹ This analysis was conducted by Joel Prakken and was recently published in the October 28, 2005 issue of MA’s *Monthly Economic Outlook*. Because we view it as an especially important topic for MPI subscribers, we are issuing it also as a stand-alone Policy Focus commentary.

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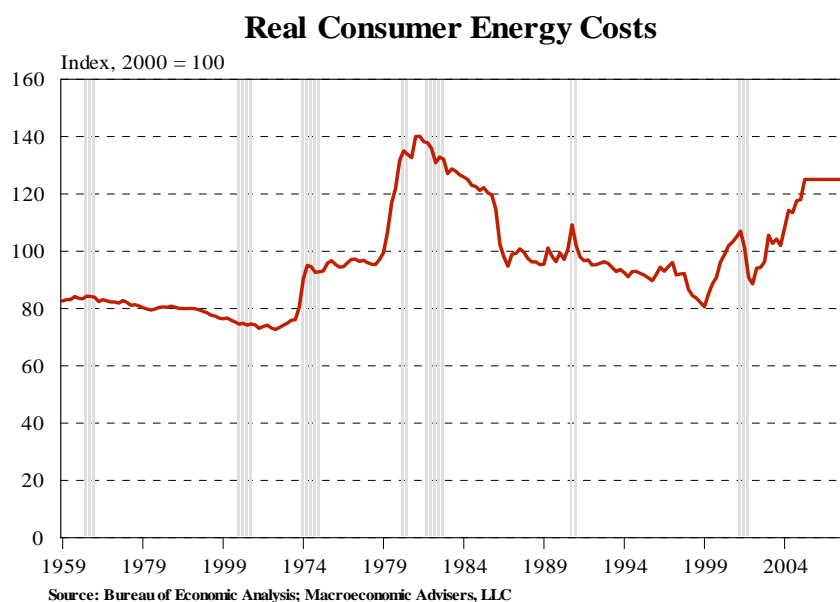
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foreseeable future. This likelihood is shown in the chart by the real price of energy leveling off at the most recent (2005:Q2) value.



Higher energy prices have undermined real disposable personal income and this, no doubt, has restrained aggregate demand relative to what otherwise would have occurred. Furthermore, there's little dispute that the rise in energy costs has boosted the headline numbers for consumer price inflation. However, from the perspective of monetary policy, a critical issue is whether the recent increase in energy prices is working its way through into core prices.

In principle, it might be. The calculation of core prices removes from changes in the overall price index those contributions emanating from changes in the prices of consumers' final energy goods and services. At first blush, then, it might seem that, at the very least, an increase in energy prices should have an observable, one-time, indirect impact on the level of core prices — that is, a temporary impact on the core inflation rate — through the cost of intermediate energy goods and services. For example, if higher prices for jet fuel lead to an increase in air fares, the resulting increase in the cost of plane tickets should, other things equal, be reflected as an increase in core prices.

Other things, however, need not be equal. Airlines may decide to absorb some or even all of the increase in fuel costs in reduced profit margins. Furthermore, prices of goods and services complimentary to air travel, like hotel rates, might decline as the demand for air-travel is undermined. In addition, there is the crucial issue of the monetary response to rising energy prices and the resulting impact on inflation expectations. A permanent increase in real energy costs is an increase in a relative price that must be offset by a decline in the relative core price level. That offset can occur through many combinations of changes in the total and core price levels. For example, in a textbook world, if monetary policy fixes the aggregate price level, an increase in the price of final energy goods and

services could be offset by an outright decline in the level of core prices. The less credible the monetary authority, the more likely that the decline in relative core prices is accomplished with core prices rising, but by less than the overall price level. Hence, in the end, the magnitude of the impact on core consumer prices of an increase in the cost of energy really is an empirical question that hinges importantly on the actual and anticipated monetary response.

A SIMPLE BUT USEFUL MODEL OF CORE INFLATION

Still, even simple reduced-form models of inflation can deliver some powerful insights into the issue. Our empirical analysis begins with a standard Phillips curve for core inflation, measured as the percentage change (at an annual rate) in the chain-type price for core PCE:

$$(1) \quad \dot{P}_t^C = -\beta(u_t - \tilde{u}_t) + \sum_{i=0}^5 a_i \dot{P}_{t-i}^E + \sum_j^3 b_j \dot{P}_{t-j}^M + \sum_{k=1}^{14} w_k \dot{P}_{t-k}^C \quad \sum_{j=1}^{14} w_j = 1$$

Here \dot{P}_t^C is the inflation rate in the core PCE price index. The first term on the right-hand side of (1) is the gap between the contemporaneous civilian unemployment rate and MA's estimate of the Non-Accelerating Inflation Rate of Unemployment (NAIRU); this is a proxy for the tightness of labor and product markets. The second term is a distributed lag of the rate of change in the real price of final consumer energy goods and services; it is intended to pick up the impact on core prices of changes in intermediate energy costs. The third term is a distributed lag of the rate of change in the real price of non-oil merchandise imports; this reflects the direct coverage of imports in consumer prices as well as any "competing goods" effects. The final term is a distributed lag of past core inflation that reflects "momentum" or "expected inflation". The coefficients in this distributed lag (are constrained to) sum to unity, implying no long-run trade-off between inflation and the unemployment gap. In this type of equation, changes in the real price of energy can affect the core inflation rate directly through the coefficients, and indirectly through the propagation of changes in real energy costs into "expected inflation".

FULL-SAMPLE ESTIMATES

We began by estimating this model over the longest possible sample, 1967:Q1 – 2005:Q2. The results of this estimation are summarized in column (1) of the nearby table. They imply a statistically significant short-run trade-off between core inflation and the unemployment gap, and also reveal a significant impact running from the real price of non-oil merchandise imports to core prices. Germaine to this discussion, there is also a significant impact running from changes in real energy prices to core inflation. The coefficients suggest that a 1 percent increase in the real price of energy directly boosts the core price index by 0.035 percent spread over 1½ years.

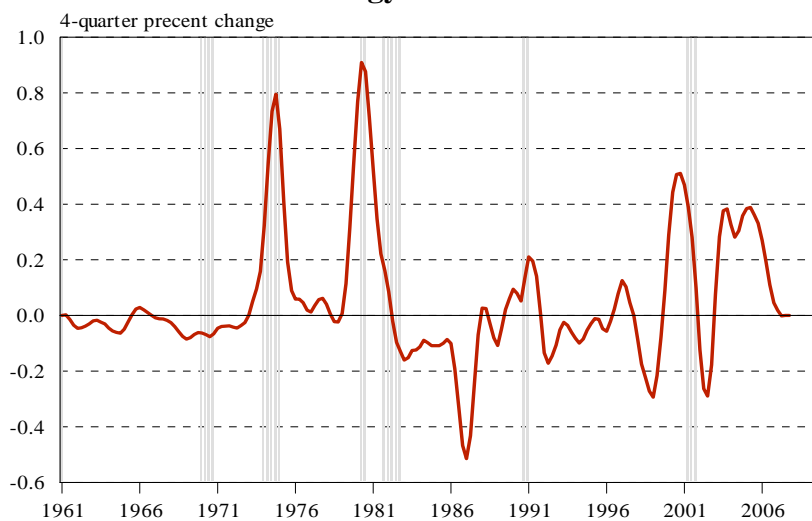
Dependent Variable: Core PCE Inflation
Sample: 1967:Q1 – 2005: Q2

	Full Sample	Split Sample
Unemployment Gap	-0.206 (3.58)	-0.244 (4.59)
Real Energy Prices		
Full Sample	0.033 (3.33)	
Before 1987		0.066 (5.53)
After 1987		-0.005 (0.36)
Non-Oil Import	0.048 (3.88)	0.043 (3.69)
Expected Core	1.000 (C)	1.000 (C)
R- Squared	0.86	0.87
Durbin-Watson	1.84	1.89

Absolute t-statistics in parenthesis. “C” indicates constrained coefficient.

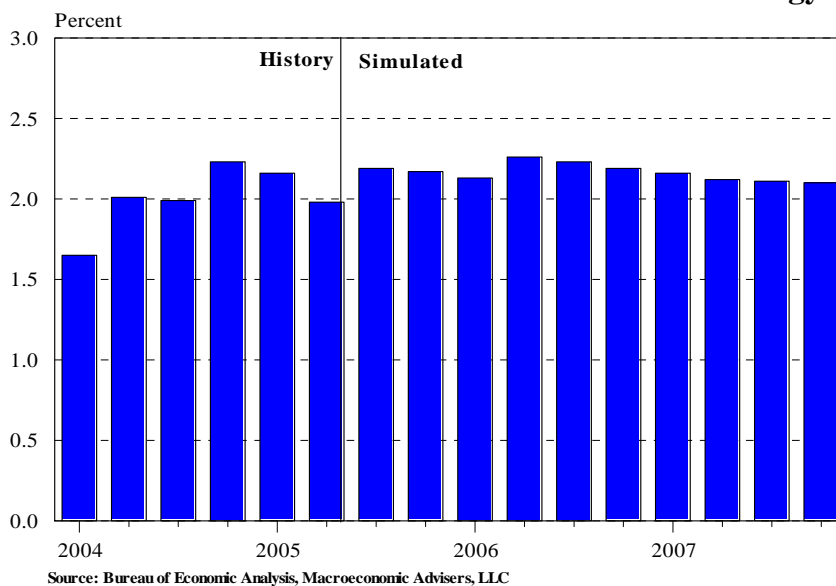
To put this linkage in better context, the nearby chart shows the “static” contribution (i.e., holding constant the equation’s proxy for expected inflation) that energy prices have made to the four-quarter percent change in core inflation since the late 1960s. The results suggest that, by this measure, the recent run-up in energy prices has indeed had a notable impact in boosting core inflation, perhaps by as much as 0.4 percentage points of late. Note, however, that assuming real energy prices stabilize at recent levels, this contribution will dwindle over the horizon of our short-term forecast. The implication is that unless energy prices continue rising even faster than they have of late, upside risks to inflation — at least from this source — are limited; indeed, there is downside risk.

Contribution of Energy Costs to PCE Core Inflation



To underscore this point, we ran a dynamic forecast of core inflation using this equation while assuming: (a) no prospective change in real energy costs; (b) forecasts of the unemployment gap and non-oil import prices from our current “base” forecast. In this simulation, historical values are used to prime the lags of core inflation in the equation, but going forwards, simulated values are inserted into the lags. This insures that the experiment includes the impact of the entire history of inflation, the unemployment gap, import prices, and energy costs on expectations as measured in this model. The results are shown in the nearby chart. The simulated values for the four-quarter percent change in core inflation remains in the low 2s, roughly consistent with our base forecast for somewhat higher inflation rates for the core CPI.

Simulated Core Inflation at Current Real Cost of Energy



A potentially interesting possibility is that the effects of energy costs on core inflation are greater when the economy is operating at high utilization (or low unemployment) rates, perhaps because under such circumstances it is possible for producers to push through rising energy costs into higher prices with less concern about undermining demand. To investigate this possibility, we included in our equation the interaction between energy costs and the unemployment gap, but found no empirical support whatsoever for this hypothesis.

THEN AND NOW

Even casual thought suggests that the two giant “oil shocks” of the 1970s were something different than we’ve experienced lately. Those events were supply disruptions associated with earth-shuddering political upheavals — the OPEC embargo and the Iranian Revolution — that had sharply increased geopolitical uncertainty. For an American society used to low and stable oil prices, the idea of such huge price increase in such a brief time really was a shocking dislocation. The economy was less energy efficient then, and so more vulnerable to the shocks. There were no futures markets or derivative products in energy to allocate the risk of price volatility to those most willing and able to bear it. There

was no Strategic Petroleum Reserve to draw upon, either physically or psychologically. The economic disruption caused by those shocks was compounded by a clumsy legislative response that included price controls, rationing schemes, and windfall profits taxes. And finally, most economic historians agree that, following these shocks, the Fed encouraged a ratcheting up of inflation expectations by vainly attempting to cushion the economy from adverse consequences of an increase in the real price of energy. In the process, the Fed damaged its credibility.

All this suggests that the potential for energy prices to pass through to core inflation could be different — that is, smaller — today than a quarter century ago. To investigate this possibility, we re-estimated equation (1) with one difference: the term in real energy prices was bi-furcated after 1987, in essence allowing different impacts before and after that date. The results of this estimation are shown in the second column of the table. Comparing columns (1) and (2), one sees that in the earlier period, the impact of energy prices on core inflation is highly significant, and nearly twice the magnitude of the impact estimated over the full sample. Over the later period, however, the impact is completely insignificant and essentially equal to zero! Our conclusion: the risk to inflation from the pass-through of recent increases in energy price is minimal. This also means that the earlier charts depict, for the recent period, something that should be considered to be a worst-case scenario.

(INFLATION) ANCHORS AWAY?

Our equation (1) handles expectations in an unsophisticated, adaptive manner that does not provide much insight into the question of whether *ex ante* expectations of inflation, and hence future actual inflation, may become unanchored in the face of the recent rise in energy prices. One way to assess this possibility is to examine recent changes in the “break-even” inflation rates implied by yields in the TIPS market. While the break-even inflation rates over the near term have risen to reflect recent moves in headline inflation, the future implied break-even inflation measures, in particular the 5-year, 5-year forward rate has shown no such rise.

Another approach is to consider the behavior of survey-based measures of expected inflation. In this regard, the staff at the Federal Reserve Board has compiled an interesting series on expectations of inflation over the next seven to ten years. It is based on the Survey of Professional Forecasters currently published by the Federal Reserve Bank of Philadelphia (formerly the Livingston Survey) and the long-term inflation forecasts reported in Blue Chip Economic Indicators. The Fed’s staff fills in missing observations by interpolation, backdates the series, and converts it from a CPI basis to a PCE basis. The history of the series is shown in the nearby chart. Note the stability of expectations over the last decade, a period during which the Fed amassed considerable credibility in financial markets.

