

# Do Energy Prices Threaten the Recovery?

Rising oil and natural gas prices have sparked concerns about the U.S. economic recovery now under way. Higher crude oil prices often squeeze refiners' margins, and increased prices for petroleum products such as gasoline, diesel and jet fuel raise transportation costs. Higher domestic natural gas prices pressure the U.S. petrochemicals industry—whose foreign competitors use crude oil or lower-priced foreign sources of natural gas—and raise costs for petrochemicals users. Increased natural gas prices boost the cost of producing fertilizer, which makes crop production more costly.

Climbing energy prices also raise costs for electric utilities and energy-intensive manufacturing sectors, such as aluminum, which can raise costs for other manufacturers. Of course, oil and natural gas producers are helped by higher prices, as are oilfield services and oilfield equipment manufacturers.

On balance, the U.S. economy has responded poorly to higher energy prices in the past. As Chart 1 shows, nine of the 10 post-World War II recessions were preceded by sharply rising oil prices. Oil prices yielded four false signals during the 1980s and '90s. So rising oil prices need not mean a recession, but the historical relationship still raises concerns about the current recovery.

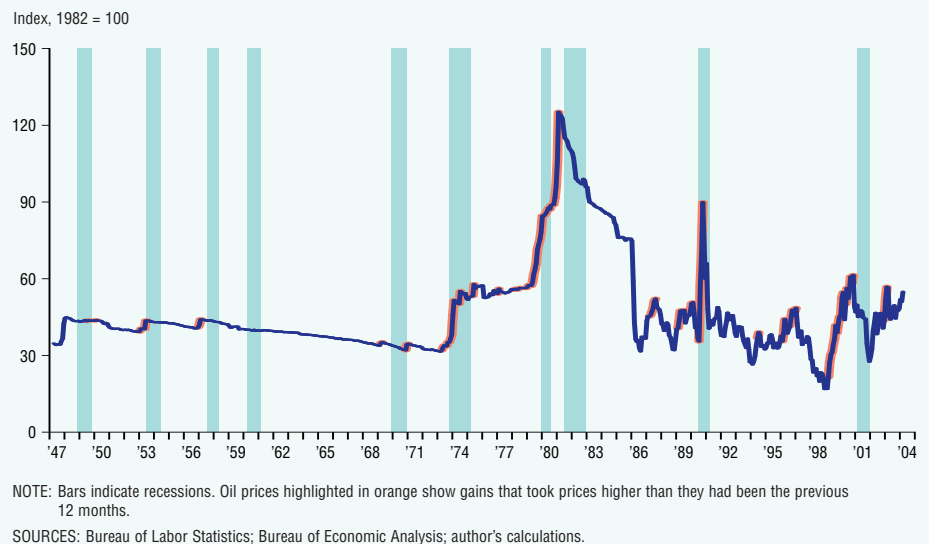
In considering the effect of higher oil and natural gas prices on the economy, several questions arise. Why have oil prices risen, and what is the likelihood they will be sustained? Why have natural gas prices pulled away from their historical relationship with crude oil prices, and what is the likelihood they will remain decoupled? Do higher oil and natural gas prices threaten the U.S. recovery? And how do the economic effects differ by sector and region?

## Why Oil Prices Are Higher

As Chart 2 shows, oil prices have risen sharply since mid-2003. OPEC has a target range of \$22 to \$28 per barrel for a market basket of the crude oils it

Chart 1

### Oil Price Shocks and U.S. Recessions



produces but has let prices rise above that range. As a result, West Texas Intermediate (WTI) rose to nearly \$40 per barrel in early May.

A number of factors account for the higher prices. World oil demand rose sharply in 2003, with the United States

and China responsible for much of the gain. In the United States, oil demand typically accelerates during an economic recovery. China's increasing industrialization and income account for gains in its demand. In addition, strong demand has boosted tanker rates. OPEC has been

Chart 2

### Crude Oil Prices Rise Above OPEC Target Range

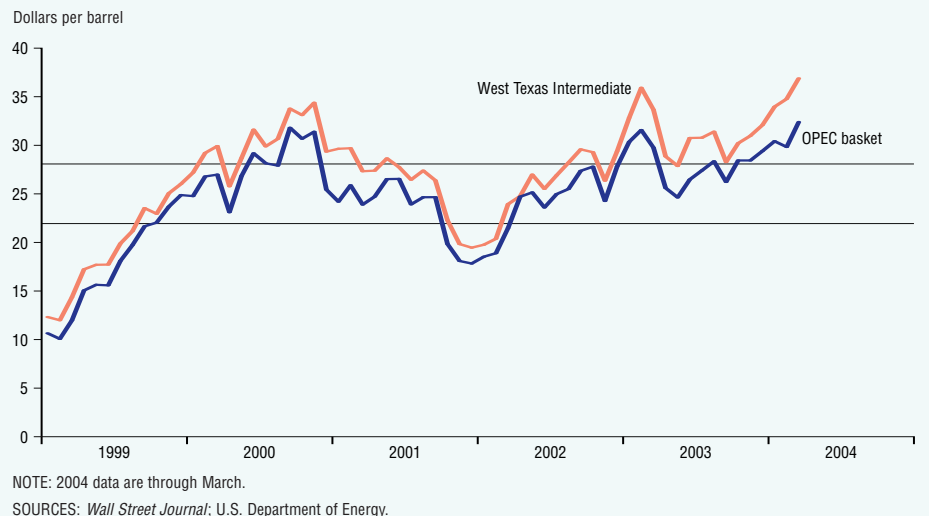
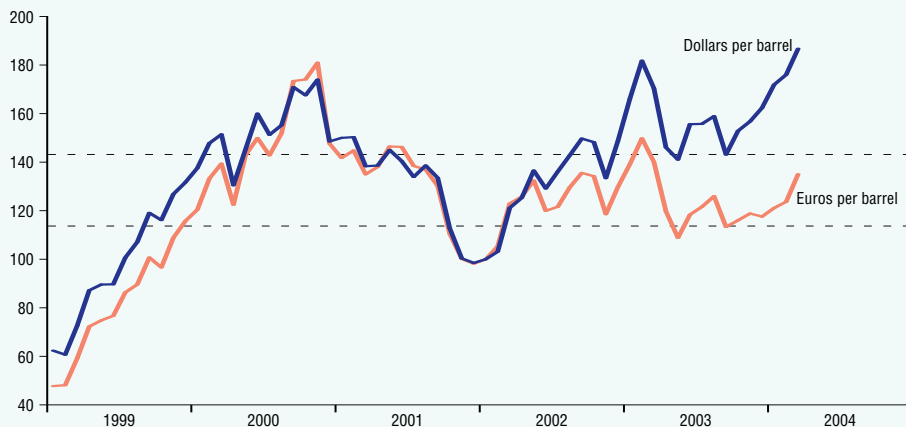


Chart 3

### Euro Oil Prices Don't Look as High

Index, January 2002 = 100



NOTE: Prices are for West Texas Intermediate.

SOURCES: Wall Street Journal; Financial Times; author's calculations.

reluctant to increase its production sufficiently to lower prices, citing concerns about seasonal decreases in consumption and the possibility of increased supply from Iraq and non-OPEC sources.

A weaker U.S. dollar also has raised the dollar price of oil. Because the dollar has generally declined against other major currencies since early 2002, prices in other currencies have not risen by nearly as much. As Chart 3 shows, the euro price of oil closely tracked the dollar price until mid-2002 but now is about the same as it was in early 2002.

The weaker dollar affects oil prices two ways. A lower-valued dollar increases the ability of foreign buyers to pay dollars for oil. At the same time, OPEC attempts to maintain its international purchasing power by raising the dollar price of oil as the dollar declines in value. Research shows that a 10 percent reduction in the value of the dollar against the currencies of other oil-consuming countries leads to a 7.5 percent increase in the dollar price of oil.<sup>1</sup>

In mid-May, the futures market showed WTI falling from about \$40 toward \$30 to \$32 per barrel over the next few years, which is about 35 percent higher than was expected in 2003. Given expectations of growing world demand, oil production and deliverability will need to increase to keep prices on the trajectory indicated by the futures market.

### Why Natural Gas Prices Are Even Higher

As Chart 4 shows, natural gas and oil prices had a stable relationship until 2000, with natural gas adjusting to movements in crude oil.<sup>2</sup> Competition against residual fuel oil (a petroleum product) by the industrial and electric power sectors set the price of natural gas, as firms switched to whichever fuel was the cheapest.

In the past few years, however, natural gas prices have decoupled from oil prices, and the relationship between the two has become unstable. If the historical relationship had remained operable, the futures market would be expecting natural gas to fall toward about \$4–\$4.50 per million Btu. Instead, the market expects prices of nearly \$6 per million Btu.

Growing demand, expectations of increased production costs and the slow development of new sources account for the upward pressure on natural gas prices. A recent National Petroleum Council (NPC) study shows North Americans becoming increasingly reliant on higher-cost sources of natural gas as demand continues to grow.<sup>3</sup> Chart 5 shows past and likely future U.S. and Canadian sources of natural gas, generally ranked from the lowest cost at the bottom of the chart to the highest cost at the top. As consumption grows, production in low-cost fields in the lower 48

*Growing demand, expectations of increased costs and slow development of new sources explain the upward pressure on natural gas prices.*

*Natural gas prices could remain elevated relative to their historical relationship with crude oil prices.*

states will decline, and an increasing share of natural gas will come from higher-cost sources such as Alaska and imported liquefied natural gas (LNG).

According to the NPC study, the outlook for natural gas prices depends greatly on domestic policy. Natural gas prices will be \$3–\$5 per million Btu (in 2002 dollars) to the extent that public policy encourages natural gas conservation, the increased use of coal in electric power plants, the increased development of natural gas in the lower 48 and Alaska, and the development of LNG import facilities. To the extent that public policy does not encourage conservation, fuel switching and the development of additional natural gas resources, prices will be \$5–\$7.25 per million Btu.

As the NPC study suggests, natural gas prices could remain elevated relative to their historical relationship with crude oil prices. The likely range is \$3.50–\$6.50 per million Btu, a range generally consistent with what experts see as technically feasible prices for LNG and natural gas from Alaska on the low end and with public policy not fostering sufficient conservation, fuel switching and natural gas development on the high end. Consistent with the futures market, the most likely range of natural gas prices in the near future is \$5–\$6 per million Btu, an outlook that is about 30 percent higher

than the historical relationship with crude oil prices. Such an estimate is slightly above the middle of the range set in the NPC study, and it incorporates the judgment that energy markets will take time to adjust to higher prices. This outlook is higher than those foreseen in recent Energy Information Administration and Energy Modeling Forum analyses, which are dominated by technical feasibility.<sup>4</sup>

Looking forward to the next decade, a major expansion of U.S. capabilities to import LNG may be under way, a development spurred by improved liquefaction technology and growing U.S. demand for natural gas. There are also good prospects for bringing substantial quantities of natural gas to the lower 48 from Alaska. Such developments bode well for increased natural gas availability and lower prices by 2010. In the near term, however, deliverability constraints are likely to mean elevated natural gas prices.

**Effects on U.S. Economy Likely to Be Mild**

Although oil and natural gas prices have risen sharply, they will likely have only mild effects on overall economic activity. Energy price shocks have less effect on economic activity than in the past, and the economy is in a strong recovery.

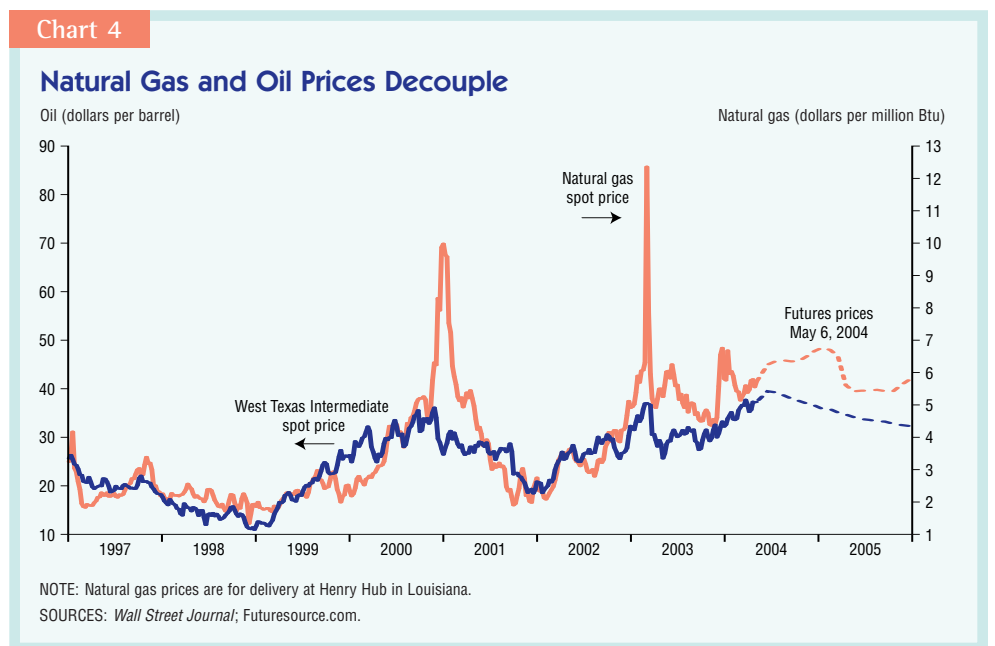
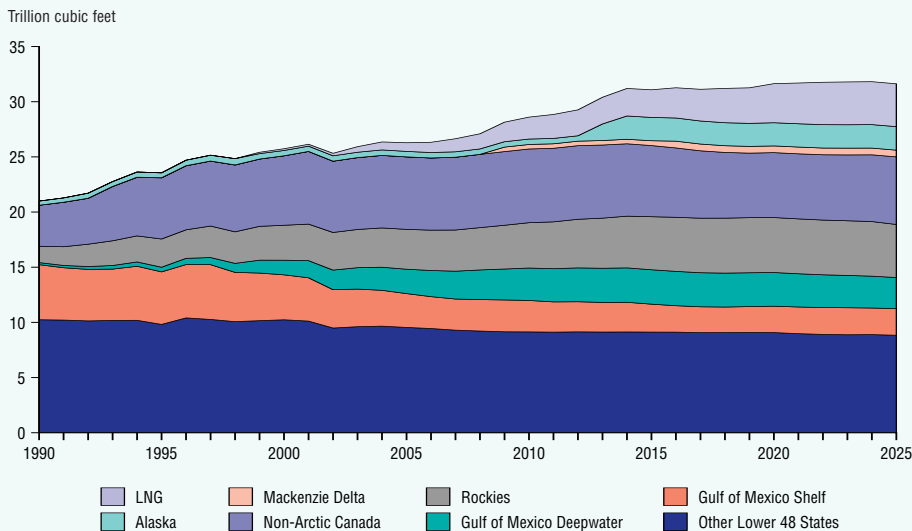


Chart 5

## U.S. and Canadian Natural Gas Production



SOURCE: National Petroleum Council, *Balancing Natural Gas Policy—Fueling the Demands of a Growing Economy*, vol. 1, September 2003, Figure 2.

*The sectoral and regional economic effects of higher oil and natural gas prices will be uneven.*

If the longer-term outlook for oil prices is about 35 percent higher than previously expected and natural gas prices are 30 percent above their historical relationship with crude oil prices, real GDP will be 0.9 percent lower than it would otherwise be. Most of the reduction in GDP (0.7 percentage point) results from the joint movement of oil and natural gas prices. Some (0.2 percentage point) results from natural gas decoupling from its historical relationship with crude oil.<sup>5</sup> The price level (as measured by the GDP deflator) will be increased by about the same amount as GDP is reduced, and there will be slight upward pressure on short-term interest rates.<sup>6</sup>

The loss in GDP will take two to three years to fully materialize. In an economy growing at about 3.5 to 4 percent annually, a one-time reduction of 0.9 percent that is spread out over two to three years won't derail the recovery.

These are milder effects than economists have estimated for past increases in oil and natural gas prices, and several factors account for the difference.<sup>7</sup> The increase in oil prices is fairly moderate by historical standards. In today's dollars, the price of oil in 1981–82 would be about \$75 to \$80 per barrel. In addition,

the energy-to-GDP ratio has declined by more than 50 percent since the early 1980s.

Firms also have more experience with energy price shocks. In the past, businesses might have understood how the shocks affected them directly, but they had difficulty understanding how the shocks affected the segments of the economy with which they interacted. The result was coordination problems across the economy that intensified the shocks' negative effects. With their experience with past shocks, today's firms can better predict how other segments of the economy will respond, reducing coordination problems.

The sectoral and regional economic effects of higher oil and natural gas prices will be uneven. Energy-intensive industries will incur higher costs and suffer reduced profit margins, while energy producers will be helped. Regions with the highest concentrations of energy-intensive industries will be hurt, and regions with energy-producing industries will be helped.

Research finds that 42 states and the District of Columbia are hurt by higher oil and natural gas prices. Eight states—Alaska, Louisiana, Colorado, New Mexico, North Dakota, Oklahoma, Texas and Wyoming—are helped.<sup>8</sup>

*Higher energy prices are only a slight drag on economic activity and do not threaten the current recovery.*

## Looking Ahead

Oil prices are likely to remain elevated for the foreseeable future—about 35 percent higher than previously expected—and natural gas prices seem likely to remain about 30 percent above their historical relationship with crude oil prices. These prices are only a slight drag on economic activity and do not threaten the current recovery. The economic effects will be uneven across industries and regions. Energy-producing states with energy-intensive industries—such as Louisiana, New Mexico, Oklahoma and Texas—are likely to benefit slightly.

Although high energy prices do not threaten the recovery, Americans cannot be complacent about energy development. Many of the factors behind the recent surge in prices, such as China's rising oil demand and deliverability constraints for natural gas, will be with us for some time. Substantial worldwide investment in oil production, LNG facilities, pipelines and the electricity grid will be needed to keep energy prices from rising above their current course.

—Stephen P. A. Brown

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## Notes

<sup>1</sup> "Exchange Rates and World Oil Prices," by Stephen P. A. Brown and Keith R. Phillips, Federal Reserve Bank of Dallas *Economic Review*, March 1986.

<sup>2</sup> "Have Oil and Natural Gas Prices Decoupled?" presented by Stephen P. A. Brown and Mine K. Yücel at a meeting of Energy Modeling Forum 20, Fuel Diversity, Natural Gas and North American Energy Markets, University of Maryland, July 2003.

<sup>3</sup> *Balancing Natural Gas Policy—Fueling the Demands of a Growing Economy*, National Petroleum Council, Washington, D.C., September 2003. Other studies, including those conducted by the Energy Information Administration and a recent study by the Stanford Energy Modeling Forum, have also found the United States and Canada will become increasingly reliant on higher-cost sources of natural gas.

<sup>4</sup> *Annual Energy Outlook 2004*, Energy Information Administration, Washington D.C., 2004; and *Fuel Diversity, Natural Gas and North American Energy Markets*, by Hillard G. Huntington, Energy Modeling Forum, Stanford University, 2003.

<sup>5</sup> All previous empirical work on the economic effects of energy price shocks is based on the linked movements of oil and natural gas prices because historically these prices have moved together. To assess the economic effects of an independent natural gas price shock, I make use of the fact that natural gas represents 40 percent of combined U.S. consumption of oil and natural gas. The resulting estimates provide only an approximation because natural gas differs from oil in several respects. Most natural gas is produced domestically, and most oil is

imported. In addition, natural gas is used primarily in the industrial and commercial sectors, and oil is used primarily in transportation. These differences may offset each other. See "U.S. Natural Gas Prices Heat Up," by Stephen P. A. Brown, Federal Reserve Bank of Dallas *Southwest Economy*, September/October 2003.

<sup>6</sup> At the firm level, higher energy prices will lead to reduced energy use and lower output than was otherwise expected. The aggregate effect of an unfavorable supply shock on the economy is similar. An input scarcity, which is indicated (in this case) by higher energy prices, leads to a slowing of GDP growth and productivity, which leads to slower wage growth and an increase in the unemployment rate. If monetary policy remains neutral (which it has done historically), the price level will rise by about the same as GDP falls. Because consumers expect the near-term effects to be greater than the longer-term effects, they will attempt to smooth consumption by borrowing or saving less, which will boost short-term rates.

This analysis uses Robert Gordon's definition of neutral monetary policy, in which nominal GDP is held constant. See "Oil Prices and U.S. Aggregate Economic Activity: A Question of Neutrality," by Stephen P. A. Brown and Mine K. Yücel, Federal Reserve Bank of Dallas *Economic and Financial Review*, Second Quarter 1999.

<sup>7</sup> See "Business Cycles: The Role of Energy Prices," by Stephen P. A. Brown, Mine K. Yücel and John Thompson, in *Encyclopedia of Energy*, vol. 1, Cutler J. Cleveland, editor, San Diego, Calif.: Elsevier, 2004, pp. 265–76.

<sup>8</sup> See "Energy Prices and State Economic Performance," by Stephen P. A. Brown and Mine Yücel, Federal Reserve Bank of Dallas *Economic Review*, Second Quarter 1995.