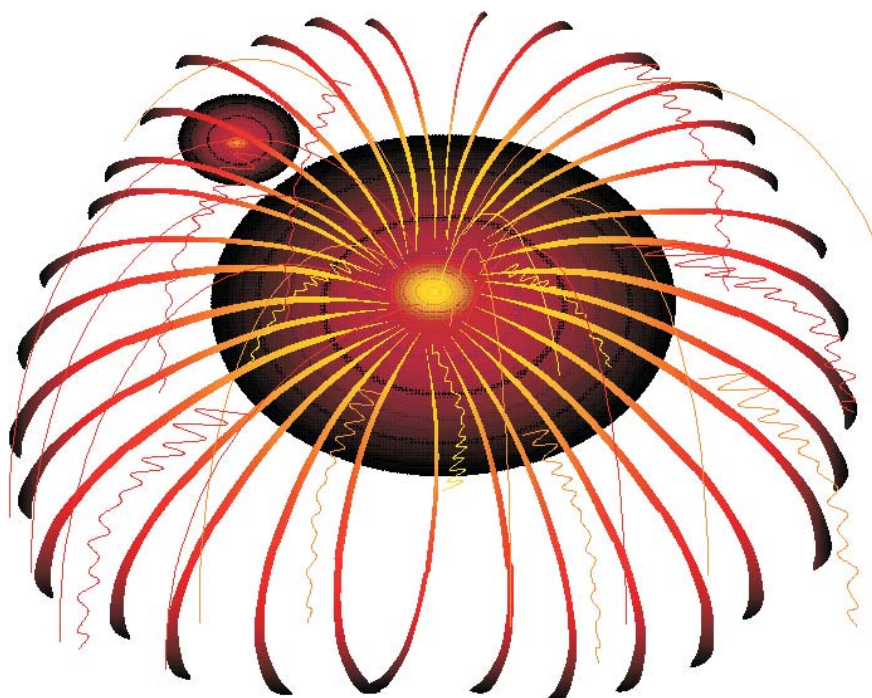


Energy Prices and the Economy



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Introduction and Overview

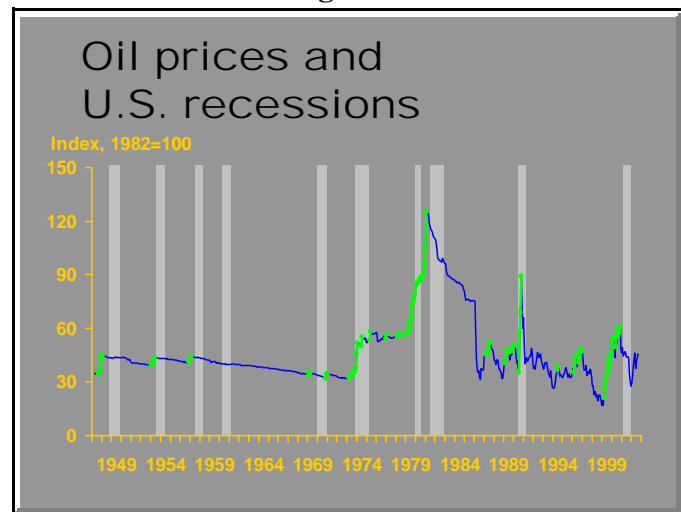
Higher oil and natural gas prices have raised concern about the possible fragility of the U.S. economic recovery that is under way.

Higher crude oil prices squeeze refiner's margins, and higher prices for petroleum products such as gasoline, diesel and jet fuel raise costs for the transportation sector. Higher domestic natural gas prices put considerable pressure on the U.S. petrochemicals industry—which has to compete against foreign competitors that use crude oil or lower-priced foreign sources of natural gas. It also raises costs for petrochemicals users. Higher natural gas prices also hurts domestic fertilizer producers, and makes crop production more costly.¹ Higher energy prices also have a considerable effect on electric utilities and their customers. As an energy-intensive sector, aluminum production can also be affected by higher energy costs, which can raise costs for manufacturers that use aluminum in their products. 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 shown in **Figure 1**, nine of the ten post-World-War-II recessions (shown in gray bars) were preceded by sharply rising oil prices (highlighted in green).² Oil prices did yield four false signals during the 1980s and 90s. So rising oil prices need not mean a recession, but the historical relationship between energy prices and recession still raises a concern.

In today's presentation, we consider why oil prices have risen and the likelihood that higher oil prices will be sustained; why natural gas prices have broken away from their historical relationship with crude oil prices, and the likelihood that higher natural gas prices will be sustained; the effect higher oil and natural gas prices on the U.S. economy — which is to slow economic growth, but not derail it; and some of the differential effects by sector and region.

Figure 1



¹When I spoke to the Congressional Subcommittee on Energy and Mineral Resources about the economic effects of higher natural gas prices on the economy last June, the panel following mine included a farmer. He testified about the effect that a tripling of fertilizer prices was having on U.S. farmers.

²The oil prices highlighted in green show gains in oil prices that take oil prices higher than they have been during the previous 12 months.

Oil prices are higher

As is shown in **Figure 2**, oil prices have risen sharply since mid 2003. A number of years ago, OPEC set a target range of \$22 to 28 per barrel for a market-basket of the crude oils it produces. As is shown here, OPEC has let oil prices rise above the target range, which has pushed West Texas Intermediate (WTI) up to about \$35 per barrel.

A number of factors account for higher oil prices. World oil demand increased sharply in 2003 — with the United States and China reported as accounting for much of the gain. In the United States, oil demand typically rises sharply during a recovery. China's increasing industrialization and income account for gains in its oil demand. In addition, strong oil demand has boosted the demand for tankers and tanker rates have risen.

OPEC has been reluctant to increase its production sufficiently to lower prices. In explaining its actions, OPEC has cited concerns about seasonal decreases in consumption and the possibility of increased supply — from Iraq and non-OPEC sources.

The weakness of the U.S. dollar also has contributed to gains in the dollar price of oil.

The dollar has weakened against other major currencies since early 2002. The consequence is that oil prices in other currencies have not risen nearly as much as the dollar price of oil. As shown in **Figure 3**, the Euro price of oil tracked the dollar price of oil closely for a number of years, but now the Euro price of oil is actually lower than it was in early 2002.

There are two ways to look at the effect of a weaker dollar on the dollar price of oil. One is to say that reductions in the value of the dollar lowers the foreign price of oil, which increases the dollar-denominated demand for oil. The other is to recognize that OPEC attempts to maintain its international purchasing power. Some of my previous research shows that a ten-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.³

Figure 2

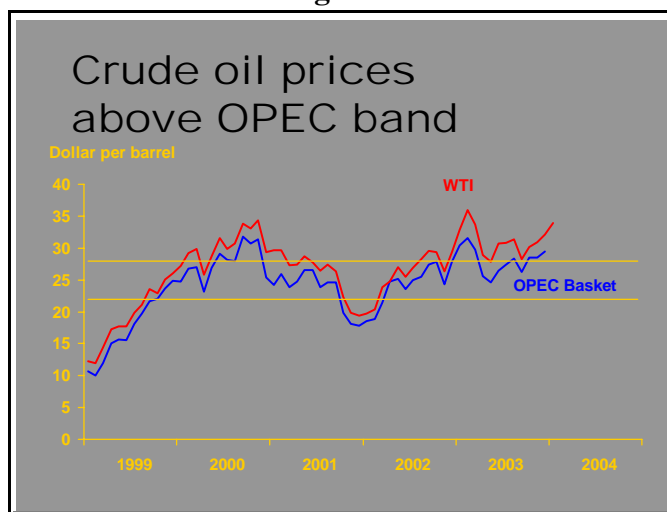
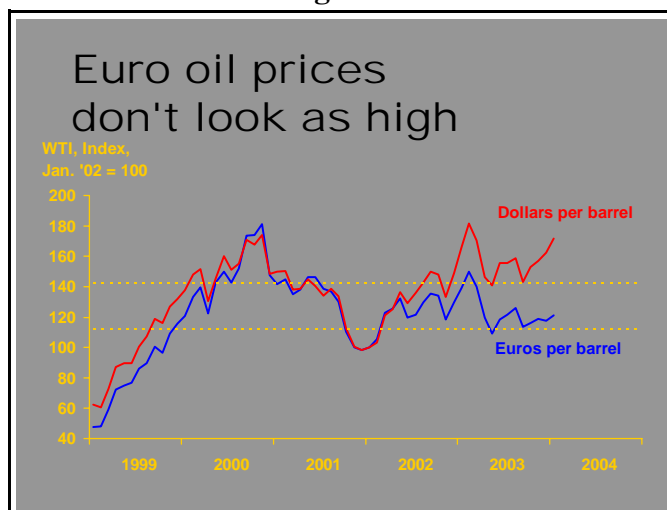


Figure 3



³Stephen P. A. Brown and Keith R. Phillips, "Exchange Rates and World Oil Prices," Federal Reserve Bank of Dallas *Economic Review*, March 1986.

Oil price outlook

Looking forward, the overall oil price outlook seems likely to be shaped by the potential for a seasonal weakness in demand, an increase in non-OPEC supply or increased OPEC production (possibly in Iraq) — all of which should lead to lower oil prices. Consistent with the futures market, look to see West Texas Intermediate to fall below \$30 per barrel as the year progresses and toward \$25 in future years. Such a forecast is about 20 percent higher than was expected a year ago.

As high as oil prices are, natural gas prices are higher

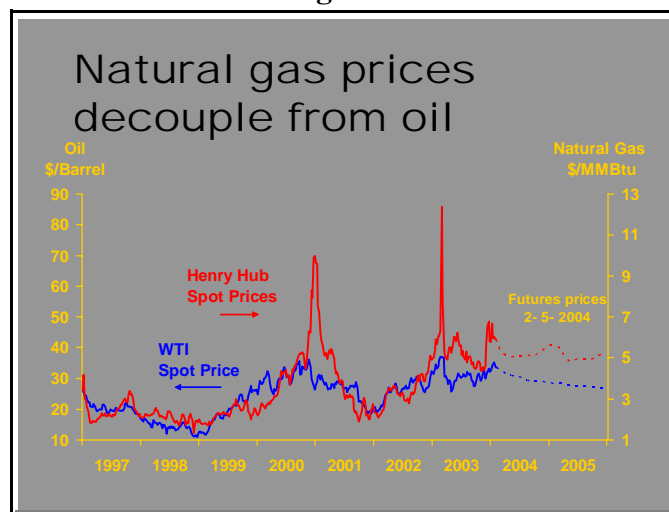
Natural gas prices have broken away from their historical relationship with crude oil prices. Some of my recent research with Mine Yücel shows that for a number of years, there was a stable relationship between oil and natural gas prices—with natural gas prices adjusting to movements in crude oil prices.⁴ The price of natural gas was set by competition against residual fuel oil in the industrial sector.

The axes in **Figure 4** have been adjusted so that the historical relationship between crude oil prices and natural gas prices is observed when the two series coincide. In the past few years, natural gas prices have decoupled from oil prices, and the relationship between oil and natural gas prices has become unstable. If the historical relationship between natural gas and crude oil had remained operable, the market would be expecting natural gas prices to be falling to about \$3.50 per million Btu. Instead, the market expects natural gas prices of about \$5.00 per million Btu.

Some people now describe natural gas prices as being set against residual fuel oil that is paying an environmental tax. In fact, regionally high natural gas prices in the Northeast during the extreme cold winter weather led some businesses and households to switch to even higher priced distillate fuel oil and kerosene. According to the trade publication *Jet Fuel Intelligence*, the increased use of kerosene was sufficient to lead to spot shortages of jet fuel.

Growing demand and expectations of increased cost of production account for the upward pressure on natural gas prices. In the past decade, many of the gains in natural gas consumption came in the electric power sector.

Figure 4



⁴Stephen P. A. Brown and Mine K. Yücel, “Have Oil and Natural Gas Prices Decoupled?” meeting of Energy Modeling Forum 20, *Fuel Diversity, Natural Gas and North American Energy Markets*, University of Maryland, July 2003.

Figure 5

Figure 5 is from a recent National Petroleum Council (NPC) study of North American natural gas markets.⁵ From the bottom to the top of the figure, U.S. and Canadian sources of natural gas *generally* ranked from lowest to highest cost. As consumption grows, the NPC study shows North America becoming increasingly reliant on higher-cost sources of natural gas.⁶

According to the NPC study, future prices for natural gas depend greatly on the direction of domestic natural gas policy. Natural gas prices will be in the lower range identified as “balanced future” 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. Natural gas prices will be in the higher range identified as “reactive path” to the extent energy policy falls behind the curve.

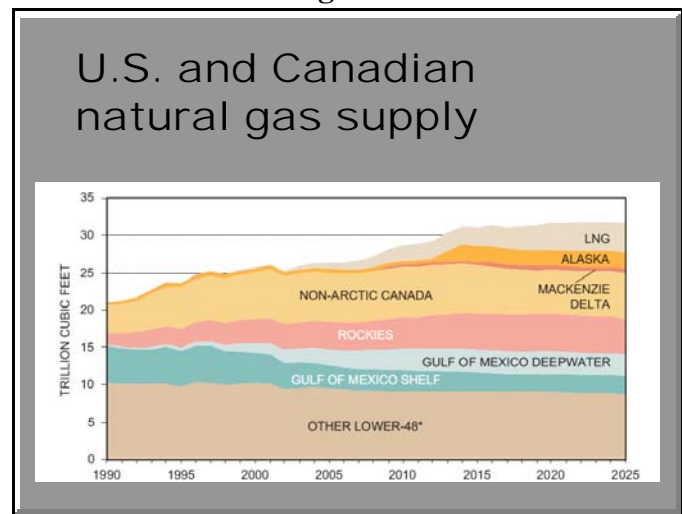
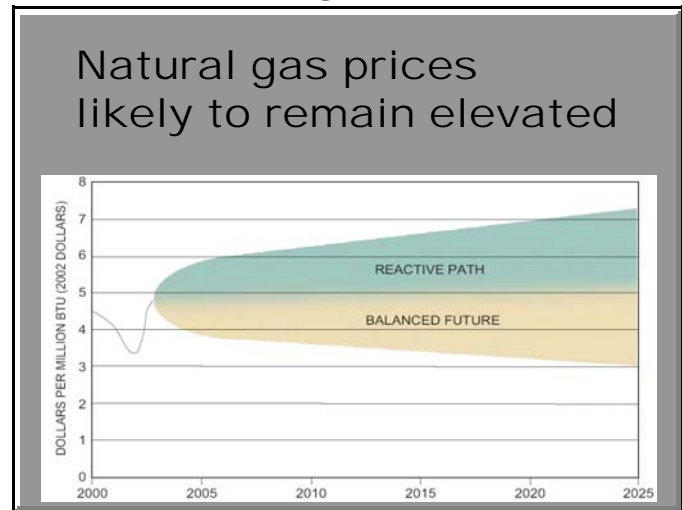


Figure 6

Natural gas price outlook

Consistent with the NPC study, I expect natural gas prices to remain elevated relative to its historical relationship with crude oil prices (**Figure 6**). The most likely range is \$3.50-6.50 per million Btu—a range that is set by technical feasibility at the lower end and policy falling somewhat behind the curve on the upper end. The most likely range of natural gas prices in the near to distant future is \$4.50-5.00 per million Btu—an outlook that is consistent with the futures market and about 45 percent above the historical relationship with crude oil prices.⁷ The estimate is in the middle of the range set in the NPC study, and it incorporates a judgement that energy policy is likely to fall behind the curve to some degree.



⁵National Petroleum Council, *Balancing Natural Gas Policy — Fueling the Demands of a Growing Economy*, September 2003, Washington, DC.

⁶The direction of resource use is generally consistent with other analyses—including those made by the Energy Information Administration (EIA) and a recent study conducted by the Stanford Energy Modeling Forum (EMF).

⁷The most likely range is for higher prices than are foreseen in recent EIA and EMF studies — studies that are dominated by technical feasibility.

Effects on U.S. economy likely to be mild

Although the expected gains in oil and natural gas prices are sizable, they are likely to have only a mild effect on overall economic activity. Energy price shocks have less effect on economic activity than in the past,⁸ and the economy is in a strong recovery.

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 signified by higher energy prices, leads to a slowing in 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.⁹ 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.

If the oil price trajectory is about 20 higher than previously expected and natural gas prices are 45 percent above their historical relationship with crude oil prices, U.S. GDP will suffer a one-time reduction of about 0.7 percent. That is, U.S. GDP will be reduced by 0.7 percent below what it would otherwise be. The GDP deflator will be increased by about the same amount as GDP is reduced, and there will be a slight upward pressure on short-term interest rates.

The loss in GDP will occur over two to three years. In an economy growing at about 3.5 to 4.0 percent annually, a one-time reduction of 0.7 percent that takes two to three years to be fully realized is not enough to derail the recovery. Of the reduction in GDP, a little more than half (0.4 percentage points) will come from the joint movement of oil and natural gas prices. A little less than half (0.3 percentage points) will come from natural gas decoupling from its historical relationship with crude oil.¹⁰

Sectoral and regional effects uneven

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

⁸Stephen P. A. Brown, Mine K. Yücel and John Thompson, "Business Cycles: The Role of Energy Prices," in *Encyclopedia of Energy*, Cutler J. Cleveland, editor, Academic Press, forthcoming 2004.

⁹I am using Robert Gordon's definition, in which neutral monetary policy is one that holds nominal GDP constant. Stephen P. A. Brown and Mine K. Yücel, "Oil Prices and U.S. Aggregate Economic Activity: A Question of Neutrality," Federal Reserve Bank of Dallas *Economic and Financial Review*, Second Quarter 1999.

¹⁰Previous empirical work about 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. Such estimates provide only an approximation because natural gas is different 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. On the whole, these differences probably offset each other. See Stephen P. A. Brown, "U.S. Natural Gas Prices Heat Up," *Southwest Economy*, Federal Reserve Bank of Dallas, September/October 2003.

Overall, Texas will benefit slightly from higher oil and natural gas prices. Texas remains an oil and natural gas exporting state. Texas also provides oilfield services throughout the world and produces oilfield equipment. Texas refiners, petrochemical, fertilizer producers and airlines will see higher costs and reduced profit margins. The negative effects will be felt more quickly, which may give the impression that Texas is no longer helped by higher oil and natural gas prices.

Summary

Oil prices are likely to remain elevated for the foreseeable future, about 20 percent above previous expectations. Natural gas prices seem likely to remain about 45 percent higher than their historical relationship with crude oil prices. These higher oil and natural gas prices will be a slight drag on economic activity, and do not pose a threat to the recovery. The economic effects will be uneven across industries and regions of the country, with energy-producing regions benefitting and regions with energy-intensive industries seeing the greatest economic losses. As an energy-producing state with some energy-intensive industries, Texas will benefit slightly.

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