FRBSF Weekly Letter

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# Oil and the Economy

Between December 1987 and March 1988, oil prices fell by nearly 4 dollars per barrel. Unlike previous years, however, this relatively sharp drop had little impact on oil drilling activity. After seasonal adjustment, the number of active drilling rigs (the "rig count") in March virtually was unchanged from December's level.

Two factors have reduced the impact of oil price changes on drilling activity and the economy. First, the increased volatility of oil prices has made it difficult to distinguish between temporary and "permanent" shifts in prices. As a result, drilling plans are unlikely to change unless changing expectations about future prices, alter the long-term profitability of drilling.

Second, the economy as a whole now is more insulated from changes in oil prices. Because of enhanced fuel switching capabilities and greater fuel efficiency, households and businesses now are better able to adjust consumption in response to changes in oil prices. Consequently, the effects of price changes are less disruptive than those observed in the 1970s.

**Permanent vs. temporary**

In the past two and a half years oil prices have been highly volatile. Since December 1985, monthly percentage changes in oil prices have been more than 11 times larger than those observed before the 1986 oil price collapse.

Increased volatility has made it more difficult to distinguish permanent changes in oil prices from temporary changes. Prices now fluctuate daily in response to data releases, announcements by OPEC ministers, and events in the Iran-Iraq war. The particular factors causing a price movement, however, seldom signal a permanent change in the underlying market forces determining the long-term price outlook.

Recent price movements, in particular, appear to be largely seasonal in nature. Prices fell in the first quarter of this year as households and businesses ran down inventories of heating oil. As refiners begin to build inventories of gasoline, analysts expect prices to rise in the late spring and early summer months. They expect prices to weaken again at the end of the summer as those inventories are reduced, and then to strengthen in the fall as heating oil inventories are replenished. High storage costs and uncertainty about future prices discourage refiners from adjusting inventories to eliminate such seasonal price fluctuations.

**Drilling response**

Because the decision to drill is based on the expected profitability of the flow of oil from the well over long periods of time, drilling plans are not adjusted significantly if price movements are perceived to be seasonal and temporary. Thus, unless political events in the Middle East, further rifts in OPEC discipline, or OPEC's success in cutting production disrupt this seasonal pattern, drilling activity likely will respond very little to oil price changes.

This change in the relationship between drilling activity and oil prices is apparent in the timing of the oil industry's response to price shocks. To see this more clearly, it is instructive to divide the period since January 1974 into four subperiods corresponding to general movements in oil prices. The period from January 1974 to January 1981 covers the period of rising prices; February 1981 to November 1985 covers the period when prices began falling; December 1985 to August 1986 covers the collapse in oil prices; and the subperiod since September 1986 covers the recent firming in oil prices.

A comparison of the industry's response to oil price changes during the four subperiods provides evidence of significant changes in behavior. According to estimated relationships, the speed with which the industry adjusts to a hypothetical permanent change in oil prices has changed over these periods. In the first two subperiods, 90 percent of the adjustment to a price change took between two and five years. In the "crash" period between December 1985 and August 1986, this adjustment took less than six months. More recently, adjustment time has risen and is approaching 12 months.

These changes in the relationship between drilling activity and oil prices reflect two factors: structural changes in the industry, such as corporate restructuring, and changes in the level of uncertainty about the direction of oil prices. The drop in oil prices after 1981 caused the industry to reduce operations and overhead. Consequently, producers' ability to respond quickly to permanent shifts in oil prices increased. The effect of improved efficiency in operations is evident in the shorter response time to price movements in the later subperiods than in the two earlier subperiods.

Recent changes in the level of uncertainty about oil prices, have to some extent, offset these improvements in producers' ability to respond to price changes by increasing the time needed to recognize that a permanent price change has occurred. During the price crash, the industry's rapid response largely was the result of its realization that the price changes were permanent. The industry quickly scaled back drilling plans from those that were profitable at $25 per barrel to those profitable at $15 per barrel. In contrast, more recent price movements have generated less immediate responses because the movements are generally believed to be temporary and/or seasonal.

The long-term effect on drilling of a permanent change in oil prices also has changed over time, reflecting adjustments in investment strategies. A 10 percent "permanent" increase in real oil prices currently yields only a long-run 7.7 percent increase in the rig count, compared to an estimated 10 to 11 percent change in the pre-1981 and "crash" subperiods, and 19 percent in the 1981-85 period.

This pattern indicates important shifts in long-term expectations over time. The largest long-run effect of oil prices was registered in the 1981-85 period when evidence mounted that prices were too high. Large adjustments in drilling plans were required to scale back exploration and development efforts. In contrast, the more recent period has been characterized by smaller long-run adjustments because long-term expectations largely have been unchanged.

The evidence of reduced responsiveness to oil price movements given the present uncertainty about future oil prices is consistent with survey responses. When asked about the impact of recent weakness in oil prices, industry respondents generally indicate that they have not changed their plans for drilling and do not expect to do so unless it appears that prices will sink lower and will remain at those lower levels.

**Direct effects**

These changes in the energy sector's responsiveness to changes in oil prices have important implications for real GNP, particularly for aggregate investment. Direct investment by the oil and gas extraction sector has been an important component of real GNP in recent years. In GNP accounting, total footage drilled in oil and gas wells is considered a tangible investment in structures. Chart 1 shows that this activity has accounted for as much as 25 percent of nonresidential investment in structures and over 1 percent of total GNP.

Changes in oil prices, therefore, have had a direct impact on real GNP through this investment channel. Rising oil prices in the 1979-1981 period expanded drilling effort and had a positive effect on GNP. Then, beginning in 1985, when prices began to fall, investment in drilling collapsed and GNP growth slowed.

The recent oil price changes may not have as large an impact on GNP as in earlier periods. Because recent price changes are viewed as temporary and not indicative of long-run trends, drillers are less likely to change their plans when prices change, making aggregate investment less sensitive to changes in oil prices.

**Indirect links**

In addition to this direct investment link to GNP, structural changes in the energy dependence of other sectors of the economy also have significantly diminished the impact of oil price changes on GNP growth. Households and non-energy-related businesses have made adjustments that enable them to shift from oil to other sources of energy more easily if prices rise.

In the past, oil price changes have had a widespread impact on the economy because oil is used either directly or indirectly by nearly all production processes. For example, falling oil prices in 1985 and 1986 reduced employment in and profitability of energy industries, but also reduced the operating costs of energy-intensive

Chart 1

**Oil and Gas Drilling Investment**

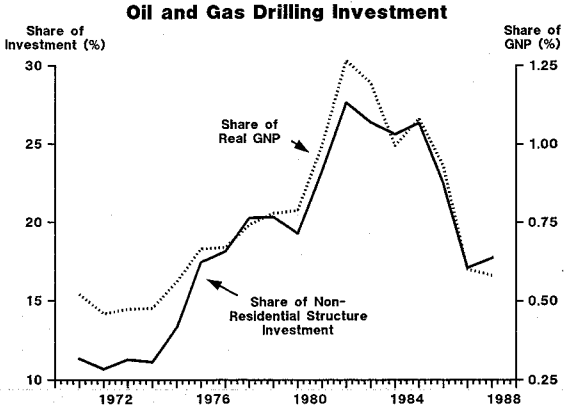
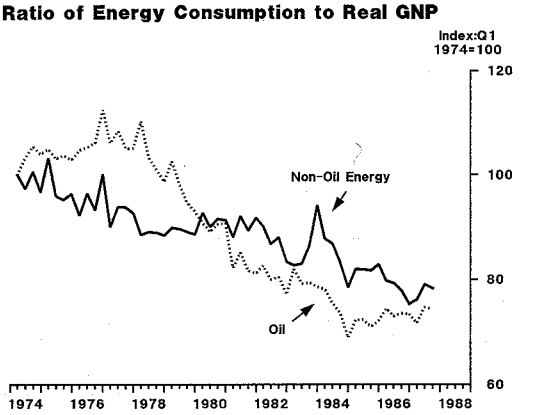



Chart 2

**Ratio of Energy Consumption to Real GNP**




producers such as airline and transportation companies, and reduced heating and gasoline costs for households.

These links between oil prices and the economy, in fact, have been very apparent since the 1973-74 oil embargo. Major increases in oil prices — and spot shortages — are widely believed to have contributed to the depth of the 1973-75 and 1980 recessions. Sudden increases in energy prices depressed profits and income, and led to reduced aggregate demand. Disparities between the efficiency of new and old production facilities and differences in heating costs caused sharp differences in the costs of production among plants and regions. The older, less energy efficient plants and industries tended to experience the highest unemployment and the largest production cutbacks as they adjusted to the higher oil prices. Consequently, aggregate income fell during these adjustment periods.

### Investment in efficiency

Because the impact of price shocks has been so severe in the past, households and businesses have made substantial investments in energy efficient plant and equipment. Automobile companies have increased sharply the fuel efficiency of cars. Homeowners have invested in insulation and more efficient appliances. Businesses have undertaken major investment projects to upgrade the energy efficiency of their production processes and to reduce their dependence on oil as an input.

Ability to substitute among fuels also has become increasingly important as oil price volatility has risen. Many large users of energy have installed generators capable of switching quickly between oil and natural gas to minimize costs when relative fuel prices shift.

As a consequence of these adjustments, the economy has moved away from its reliance on oil. The ratio of energy consumption, particularly oil consumption, to GNP has fallen, indicating a movement away from oil and energy in favor of other inputs. (Chart 2) Moreover, empirical studies generally support the view that consumers and business now have substantially greater ability to substitute away from oil in the event of price increases.

### Net effect

As a result of higher price volatility and a more insulated economy, current changes in oil prices are less likely to induce changes in real GNP. Price changes still will have effects on income as they change the profitability of oil companies and the energy bills of energy users, but the disruptive effects on U.S. industrial structure observed in the past are not likely to recur in the present environment. Only if a major — and permanent — change occurs in the oil market, such as a dramatic change in OPEC's cohesiveness, will oil price movements cause significant changes in the real economy.

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