

THE ROLE OF SUPPLY, DEMAND, INDUSTRY  
BEHAVIOR AND FINANCIAL MARKETS IN THE  
GASOLINE PRICE SPIRAL

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## **EXECUTIVE SUMMARY**

### **SKYROCKETING PRICES AND OIL COMPANY PROFITS**

In six of the past seven years, gasoline prices have skyrocketed. The typical household will pay well over \$1,000 more for gasoline in 2006 than it spent on average in the late 1990s.

While numerous different causes have been offered as the origin of the price increases, two things are constant -

- There has been a shortage of refinery capacity, and
- oil company profits have soared, setting records, including four of the five most profitable years in the history of the U.S. oil industry since the 1973 oil embargo. Compared to the Standard and Poor's Industrial Average, the oil industry had over \$100 billion in excess profits in the past six years.

During this wild spiral, we frequently hear the claim that this is just market forces of supply and demand at work, but that is not the case in either the world crude market or the domestic gasoline market. If competitive forces of supply and demand were operating as they should, there would be 15 million barrels more capacity in the world crude oil market, at least 3 million barrels more capacity in the domestic refinery market, and the price of a gallon of gasoline would be close to \$1.50, not hovering around \$3.00. Strategic under-investment in capacity has kept markets tight.

### **THE DOMESTIC REFINING SECTOR**

While crude oil price changes greatly affect the price of gasoline, profits in the refining sector do, as well. The domestic spread - the share of the pump price that the domestic refining and marketing sectors take - has increased by over 30 cents per gallon in the past few years. In April and May it was over 50 cents higher than the average of the late 1990s.

Net income from domestic refineries increased from \$1 billion in 2001 to almost \$25 billion in 2005. This increase is much larger than the increase in refining profits in foreign markets earned by these same oil companies.

The origin of the tightness in the gasoline market can be readily identified:

- A merger wave during the 1990s led to consolidation in the industry and the closing of numerous refineries.
- Although existing refineries have been expanded, oil consumption has increased twice as fast as refining capacity and gasoline consumption has increased two-and-one-half times as fast.
- While consumption has increased by 20 percent, gasoline in storage has declined by 6 percent.

With refinery and state wholesale markets becoming concentrated, with refinery utilization rising and storage declining, the oil companies have gained market power over price. There are so few competitors that they do not have to collude to raise prices, they can do so unilaterally and watch the handful of companies in the industry adopt parallel and reinforcing courses of action. Oil companies have shifted from competing on price to gain market share to maximizing profits by restricting capacity and output.

#### **FINANCIAL COMMODITY MARKETS**

Financial commodity markets are also contributing to the upward spiral of prices. Huge increases in the volume and value of trading means more and more money is chasing a relatively fixed physical quantity of oil produced and consumed. Rising volatility and increasing risk add to the upward pressures on prices, as traders demand to be rewarded for taking risk; owners of the physical commodity demand higher prices to give up the option of selling later; and transaction costs mount. The upward pressure on prices in financial markets may account for as much as 20 percent of the price of crude. Moreover, the gap between the financial market price and the physical market price has grown.

The huge increase in the domestic spread and refiner margins, as well as the price frenzy in financial markets, may have another effect. Things have gotten so bad in the U.S. gasoline market that the tight U.S. gasoline market may be "pulling up" the price of crude. After all, the U.S. is the largest single oil consumer in the world and the largest

gasoline market by far, accounting for over a quarter of the worldwide total. When the domestic spread and refining profits go up, it signals that there is more consumer surplus - more rent - to be extracted from the American consumer. Similarly, the increasing spread between futures and physical markets indicates to owners of the physical commodity that there is more value to be extracted.

## **POLICY RECOMMENDATIONS**

The vast majority of the activity in the physical and financial oil markets falls under federal jurisdiction. Yet, over the course of the past six years federal policy makers have done little to address the fundamental flaws in the oil industry market structure. Long-term structural change to alleviate pressure on the gasoline market must come from outside of the industry - reduction of demand and increased use of alternative fuels.

The key long-term structural change that will do the most to alleviate the pressure on the gasoline market is to increase the fuel efficiency of the U.S. vehicle fleet.

On the supply-side, biofuels - ethanol and biodiesel - could displace a significant quantity of oil consumption. Biofuels have three characteristics that make them attractive as a strategy for reducing oil consumption and also relieving pressure on prices - new resources, new facilities and new entrants.

Petroleum markets will continue to play a key role in the nation's economy for decades to come, even if aggressive policies are pursued to alleviate the tight supply conditions. Antitrust authorities should be directed to review unilateral actions that raise prices. Congress should form federal-state joint task forces to oversee the industry, so there is greater scrutiny from a variety of points of view.

Financial markets for energy commodities require more oversight. At a minimum, the public deserves an intensive examination of every aspect of the petroleum market. Oversight of financial markets must be strengthened by requiring registration and reporting of large trades in over-the-counter markets. On regulated exchanges margin requirements and

trading rules should be re-examined to ensure that large players cannot move markets with little actual investment.

## **I. INTRODUCTION**

### **GROWING CONCERN ABOUT RISING ENERGY PRICES**

Attorney General Lautenschlager has asked me to examine the current state of the gasoline market within the analytic framework of two primary factors: physical market fundamentals of supply and demand, and the role of financial markets as a driver of the upward volatility of gasoline prices.

The source of public concern about soaring gasoline prices is obvious. American consumers are reacting differently to \$3.00 per gallon gasoline prices now than they did last fall. At that time, the immediate cause was obvious - the hurricanes in the Gulf. Profits soared last year, affirming the suspicions of many that oil companies were exploiting severe market conditions. Today's gasoline prices cannot be explained by a weather event and seem to highlight a fundamental, long-term problem in the industry - a lack of competition that enables oil companies to exploit a tight market that they have created and preserved through strategic underinvestment and mismanagement.

The prospect of sustained high prices at these levels is alarming to the average American household for good reason. (See Exhibit I-1) If gas prices average \$2.50 per gallon over the course of this year,<sup>1</sup> the typical family household will experience an increase of well over \$1,000 to their annual gasoline bill compared to the late 1990s. If household expenditures for natural gas (the dominant heating fuel in the Midwest) are combined with gasoline expenditures, we find that these two products have taken a huge bite out of household budgets, having increased by about \$2000 per year since the late 1990s.

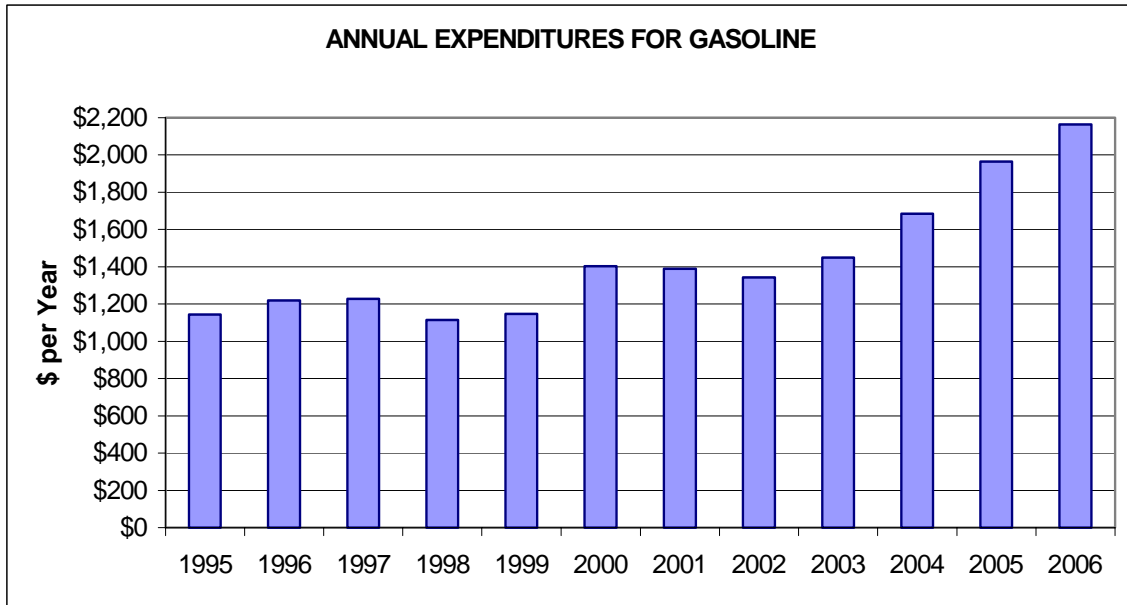
### **SIMILARITIES BETWEEN NATURAL GAS AND GASOLINE**

We should not be surprised to find very strong similarities between the natural gas market, which I recently analyzed in detail,<sup>2</sup> and gasoline markets and a similar price spiral (see Exhibit I-2). They share a number of characteristics.

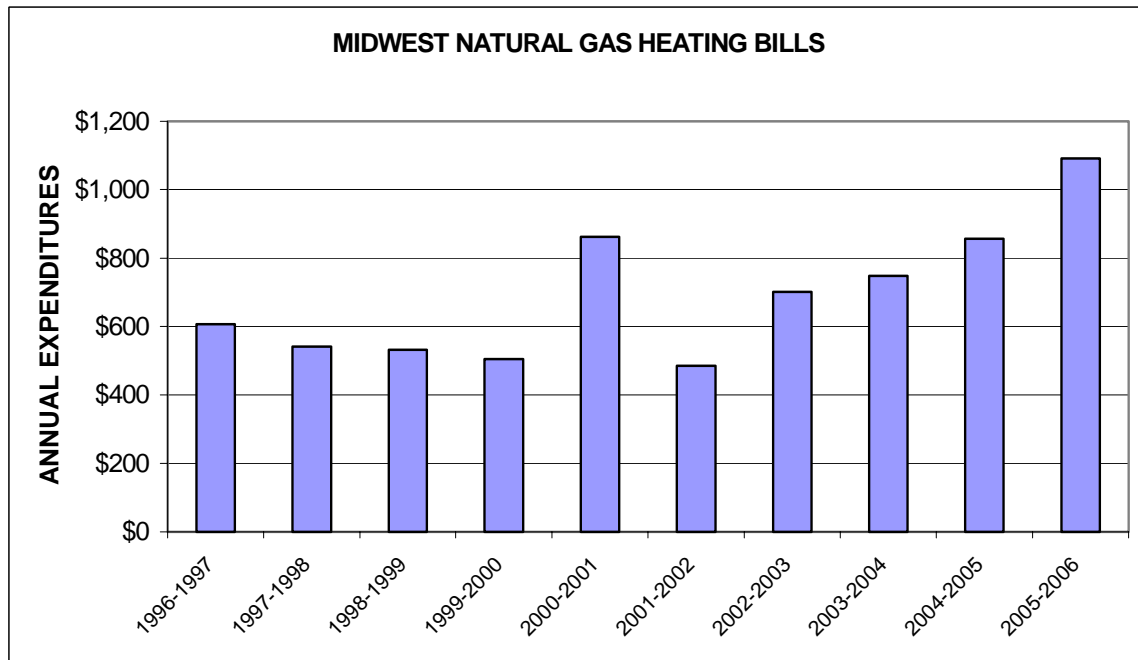
In the physical markets:



**EXHIBIT I-1:  
HOUSEHOLD EXPENDITURES ON PETROLEUM PRODUCTS**

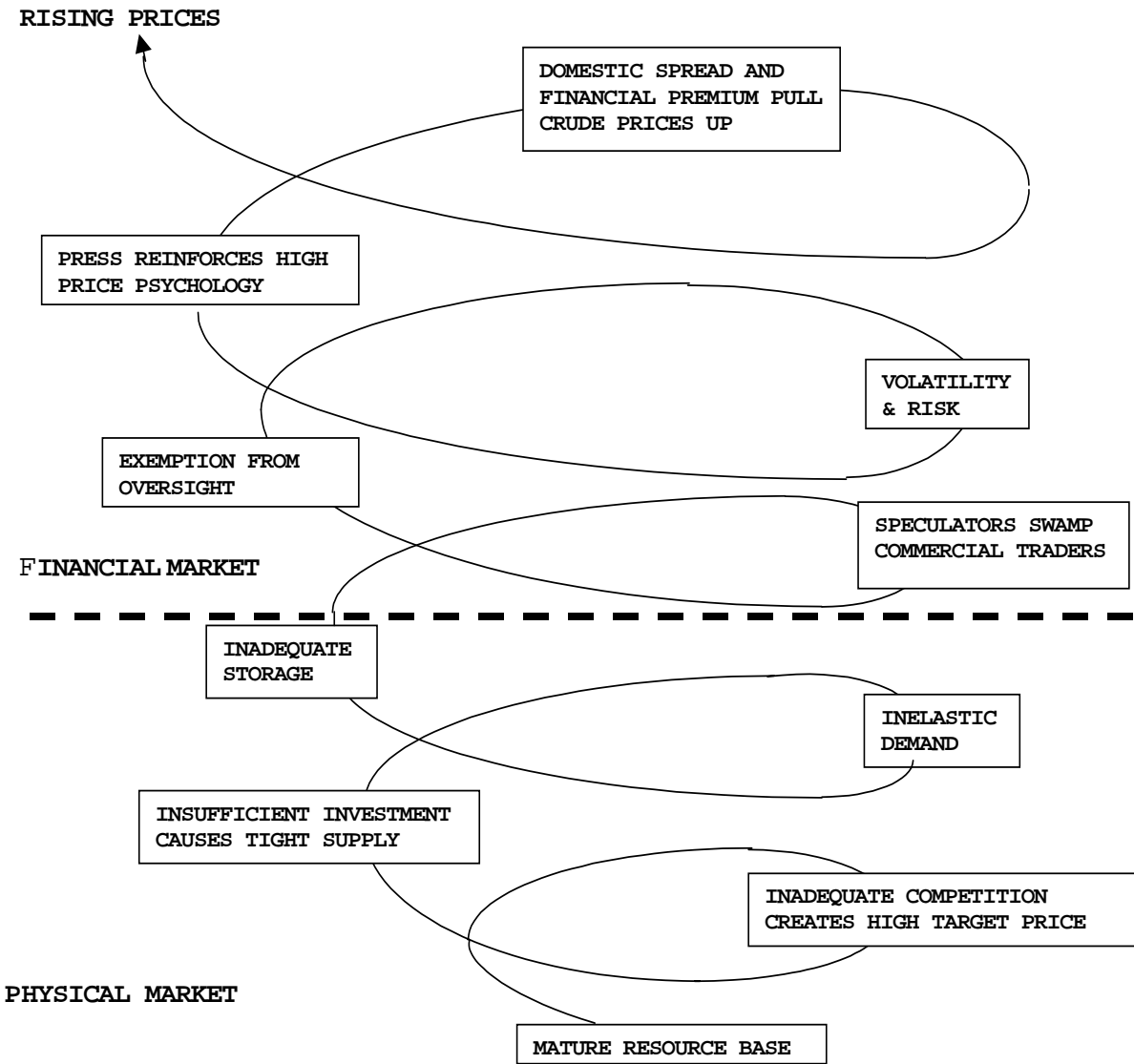


Source: Bureau of Labor Statistics, *Consumer Expenditure Survey*, various issues; Energy Information Administration, *Petroleum Prices*.



Source: U.S. Energy Information Administration, *Annual Energy Outlook*, December 2005 and *Winter Heating Bills*, various issues.

**EXHIBIT I-2:  
CAUSES OF SPIRALING GASOLINE PRICES**



- On the supply side, they are both capital intensive industries with many barriers to entry and the same companies dominate a concentrated physical market.
- A pattern of inadequate investment over a sustained period has kept the market tight.
- On the demand side, they are both vital necessities for which there are few good substitutes. This means the elasticity of demand is very small.
- Because of the low elasticity of supply and demand in the short term, storage plays a critical role in each industry.

The financial markets for both are quite similar.

- There is a huge volume of trading, much of it in unregulated, over-the-counter markets. That trading has increased dramatically in both volume and dollar value in the past few years.
- Volatility and risk have increased sharply.

The primary responsibility for overseeing the physical and financial markets resides at the federal level.

The pricing pattern of the past half-dozen years is similar in the two industries.

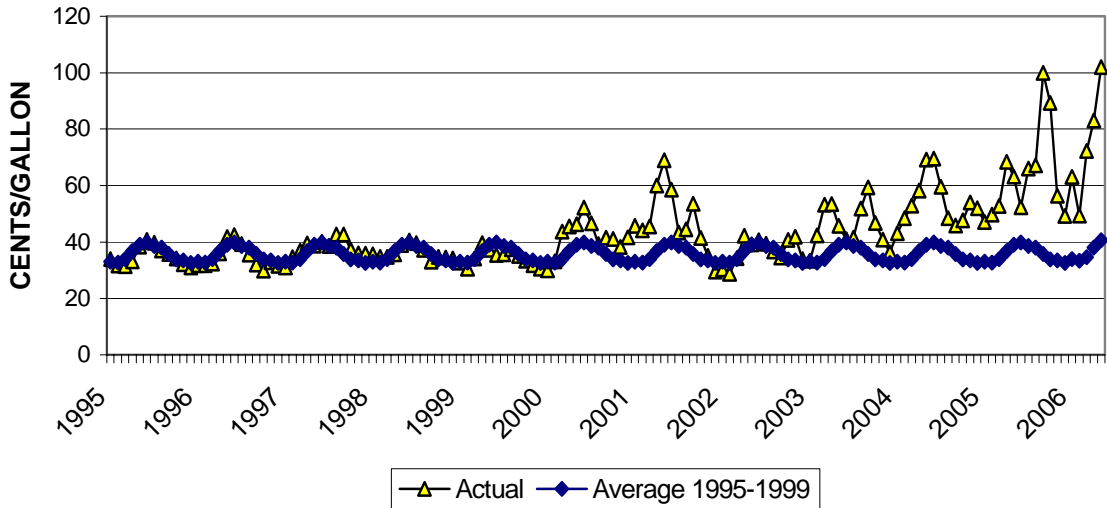
#### **DRAMATIC CHANGES IN THE DOMESTIC PRICING OF PETROLEUM PRODUCTS**

The starting point for the natural gas analysis was the very sharp break observed in the domestic pricing pattern since 2000, coincident with changes in financial market trading behavior.<sup>3</sup> Gasoline prices exhibit a similar change in pattern (see Exhibit I-3).

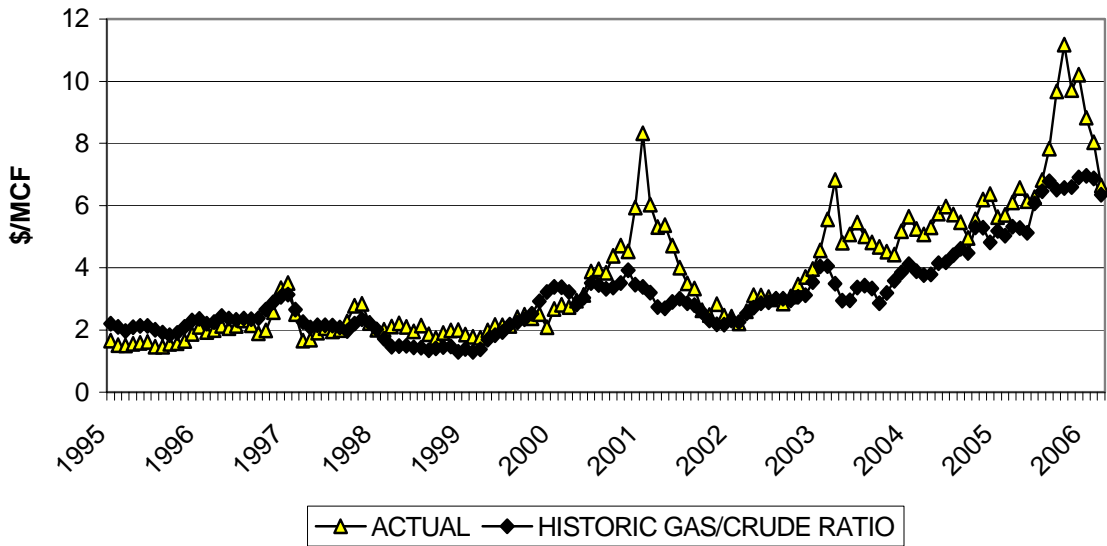
For these purpose, we isolate the effects of domestic factors in the industry. In the upper panel of Exhibit I-3 we analyze what is known as the domestic spread for gasoline.<sup>4</sup> The domestic spread is calculated as the pump price of gasoline minus crude oil and taxes, which historically ranged from 33 to 40 cents in recent years. The calculation of the domestic spread isolates the share of the pump price that represents domestic refining and marketing costs and profits. In the

**EXHIBIT I-3:  
CHANGING DOMESTIC PRICING OF PETROLEUM PRODUCTS**

**GASOLINE DOMESTIC SPREAD**



**THE DOMESTIC SHIFT IN NATURAL GAS WELLHEAD PRICES**



Source: Energy Information Administration, Petroleum Database.

lower panel of Exhibit I-3 we have added the relationship of natural gas and crude oil prices to an Exhibit ES-7 from the recent natural gas report.<sup>5</sup> Since most natural gas consumed in the United States is produced here, the change in pricing relative to crude represents a shift in domestic pricing behavior.

The change in pricing behavior for both gasoline and natural gas after 2000 is evident. Beginning in 2000, but particularly after 2002, domestic prices began to rise sharply above their historic levels. Historically, the domestic spread on gasoline - the difference between the price at the pump, minus crude oil and taxes - varied narrowly in a seasonal pattern from 33 cents per gallon in the winter to 40 cents per gallon in the spring. Since 2002, the domestic spread has increased steadily. In the first quarter of this year (January - March), averaged about 60 cents, 30 cents per gallon above the historic average. In April it was over 80 cents and by May it was around \$1.00, or almost three times the historic average. A 50-cent per gallon increase in the domestic spread adds over \$5 billion dollars per month to national expenditures on gasoline.

#### **FUNDAMENTAL STRUCTURAL PROBLEMS IN PETROLEUM MARKETS**

In the gasoline market, the underlying tightness of the refining sector has become a key trigger for the recent price spirals. Refining has, in fact, become the bottleneck.

Refining capacity has simply not kept up with increasing demand, resulting in a severe tightening of the domestic gasoline market. Record high prices and profits today reflect a structural change in the industry that has been developing over the past decade and a half - a lack of competition in a market where the forces of supply and demand are too weak to prevent abuse of consumers. This enables oil companies to exploit the tight market that they have created and preserved through strategic underinvestment and mismanagement.

There is insufficient competition on the supply-side to force producers to expand capacity and alleviate pressures on prices. Demand is so inelastic that when prices are increased, consumers cannot cut back sufficiently.<sup>6</sup> Having kept markets

tight and eliminated competition, the oil companies can exploit any excuse to drive up prices and profits.

Things have gotten so bad in the U.S. gasoline market that even the Energy Information Administration, in a recent edition of its weekly report, *This Week in Petroleum*, recognized that the tight U.S. gasoline market may be "pulling up" the price of crude.<sup>7</sup> After all, the U.S. is the largest single oil consumer in the world and the largest gasoline market by far, accounting for over a quarter of the worldwide total. When the domestic spread and refining profits go up, it signals that there is more consumer surplus - i.e., more rent - to be extracted from American consumers.

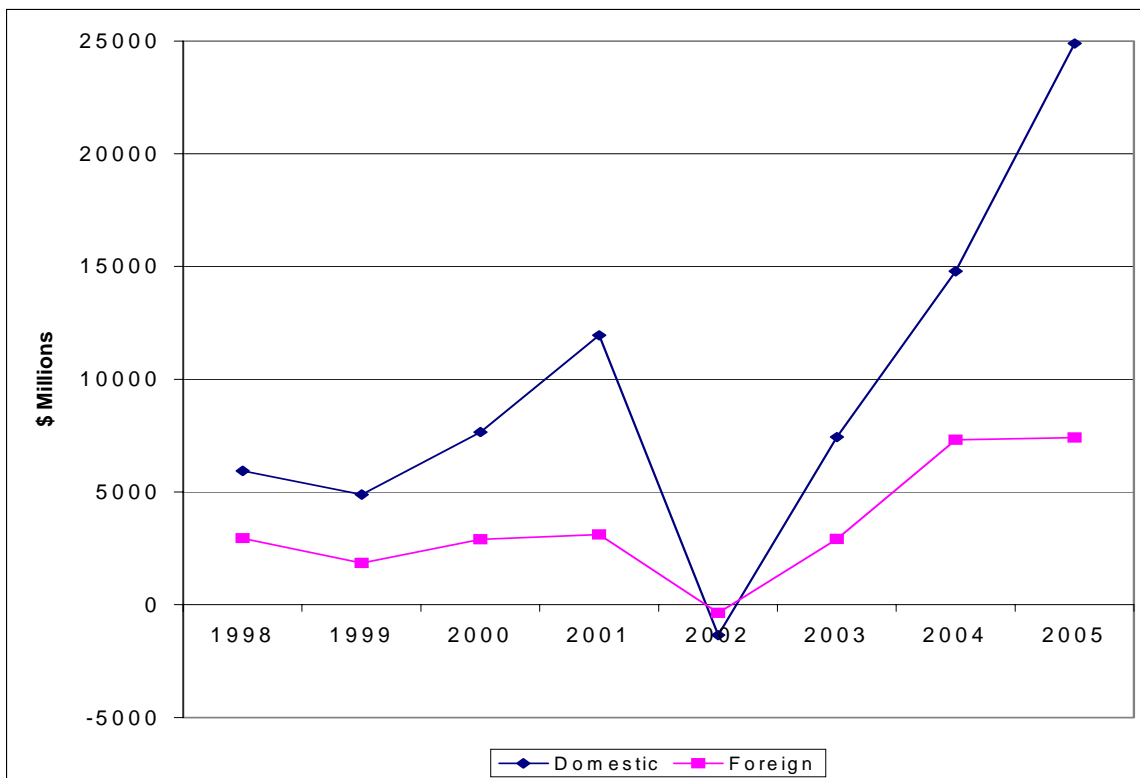
In recent years the upward pressure on prices and the demonstration of more rent to be extracted has been reinforced by commodity markets. The *New York Times* recently noted in an article headlined, "Trading Frenzy Adds to Jump in Price of Oil,"<sup>8</sup> that some analysts believe a huge increase in trading volume, volatility and risk are adding as much as 20 percent to the price of oil. The trading frenzy may well be pushing up the price at the pump, which pulls up the price of crude.

## II. PRICING AND PROFITS

### DOMESTIC REFINING AS A PROFIT CENTER

The massive increase in prices has led to a huge increase in profits for the oil companies. One of the most interesting ways to see how the oil companies have used the domestic refining sector to drive up gasoline prices is to compare the income from domestic refining operations to income from foreign refining operations. If the problem were really global then we would expect to see little difference between the domestic and foreign operations of these companies. In fact, a huge difference between the two has developed in recent years. (See Exhibit II-1) Domestic U.S. refining has become a major profit center and cause of increasing prices.

**EXHIBIT II-1:  
NET INCOME ON DOMESTIC AND FOREIGN REFINING OPERATIONS**



Source: Energy Information Administration, *FRS Survey Data 1977-2004, Petroleum Operations*, *Financial News Major Energy Companies, Fourth Quarter 2005*; *Financial News Independent Energy Companies, Fourth Quarter 2005*.

Over the course of two decades from the late 1970s to the late 1990s, foreign and domestic refining profits were close. After the merger wave, which began in the late 1990s, domestic refining profits started to rise dramatically in the U.S., but not abroad. In 1998, the Energy Information Administration expanded its coverage of the refining sector. This established a new baseline for domestic and foreign refining operations, before the merger wave hit the U.S. Between 1998 and 2002, the following mergers affected the refining sector: Exxon-Mobil, BP-Amoco-Arco, Chevron-Texaco, Conoco-Phillips-Tosco, Valero-Total, Marathon-Ashland. Fourteen companies were reduced to seven.

During the period since 2002, net income for domestic U.S. refining operations increased from just over \$1 billion to almost \$25 billion in 2005. For the companies' foreign refining operations, it increased from under \$1 billion to about \$7 billion over the same period. This increase in income comes directly out of the consumer's pocket in the price at the pump. Output has remained relatively constant in both the domestic and foreign operations. The big oil companies have almost doubled their rate of profit per barrel on domestic refining compared to foreign operations. Thus, gasoline price spikes are associated with huge increases in refiner profits.

#### **OVERALL PROFITS**

The overall profits in this industry reflect a similar pattern. Total industry profits have skyrocketed, based on a comparison between the industry and the return on equity of the Standard and Poor's Industrials sector. (See Exhibit II-2)

The Department of Energy noted in its most recent comprehensive analysis of *The Performance Profiles of Major Energy Producers* (for 2004) that the major oil companies, known as the FRS companies (large energy producers required to file in the Financial Reporting System), had experienced a sharp increase in income and profitability driven by product price increases:

Profitability - a measure of a company's or an industry's net income relative to the equity or capital provided by investors - rose to 22.1 percent, surpassing the previous peak of 21.1 percent in 1980.



The return on stockholders' equity for the FRS companies has been substantially higher than that of the Standard & Poor's (S&P) Industrial companies for 4 of the past 5 years, a trend not seen since the high-price period of 1979-1981.<sup>9</sup>

In Exhibit II-2 we have added estimates of the 2005 return on equity to the series presented by the Energy Information Administration. In 2005, net income and return on equity increased sharply. In fact, 2004 and 2005 each set a record. Four of the five most profitable years since the oil embargo of 1973 have occurred since 2000. Reports for the first quarter of 2006 indicate increased profits above the 2005 record levels. These huge increases are excessive by several critical measures.

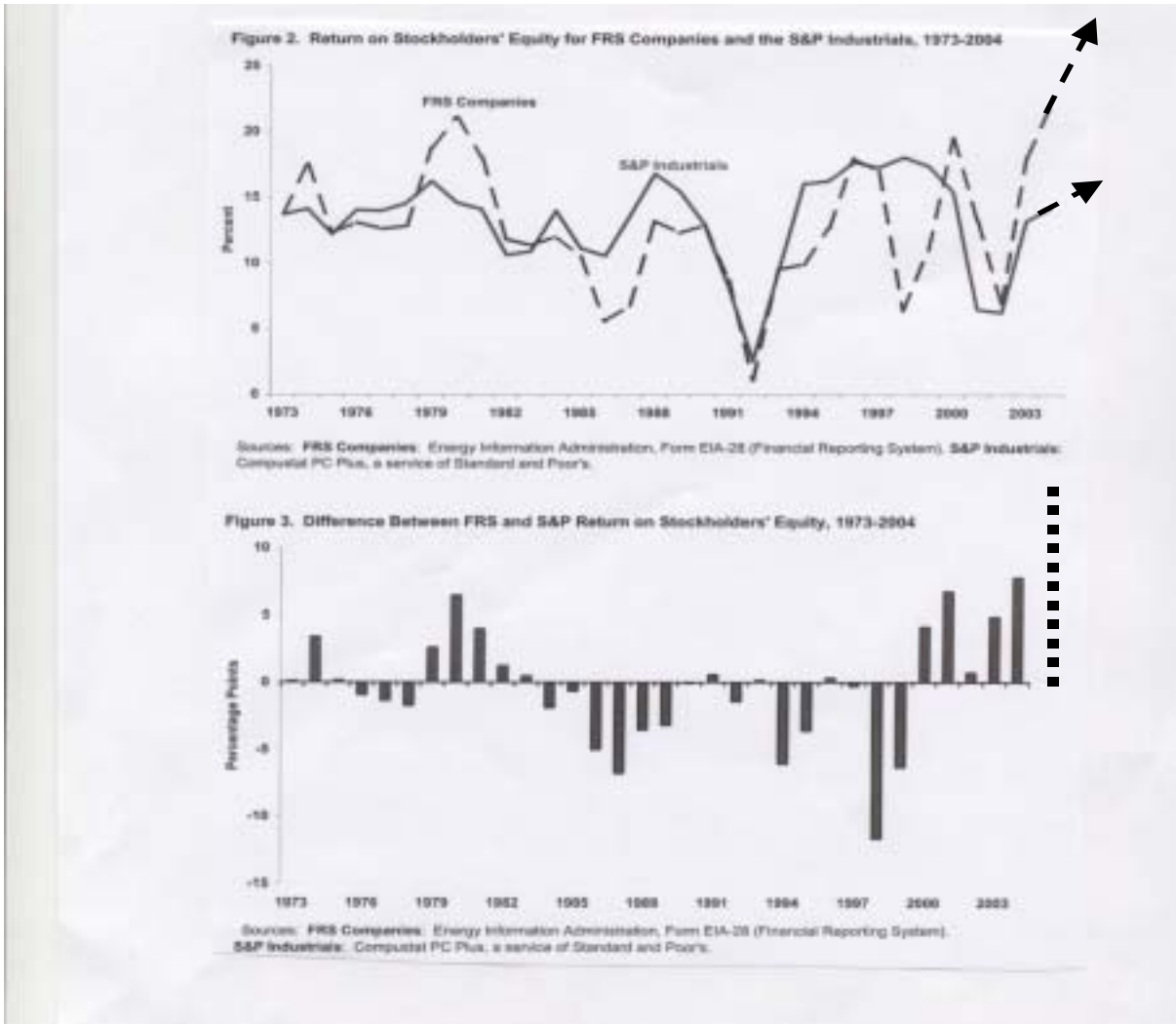
The historic pattern over fifteen years, where oil companies earned somewhat less than the S&P Industrials is, in fact, the proper baseline. The return on equity should reflect the underlying risk in the sector. Wall Street measures riskiness by the variability of profits (measured by the Beta); the major oil companies are well below the average by this measure. The reason is that demand for oil is highly inelastic - it does not fluctuate widely. Competition is weak and barriers to entry are high. As a result, the oil industry faces less business risk than other large companies.

Compared to the return on equity in the 1985-1999 period, in 2000-2005 the major oil companies have enjoyed a huge windfall. If we assume the average return in 1985-1999 compared to the S&P Industrials in that period, the increase in 2000-2005 is about \$150 billion in excess profits. That translates to over \$200 billion in before-tax profits, which is what the consumer pays. Even if we assume that the oil industry should have the same return on equity as the S&P Industrials (despite a substantially lower risk factor), the excess since the start of the 21<sup>st</sup> century would be about \$100 in after-tax profits, or about \$150 billion in excess prices paid by consumers. By either measure, it is a huge windfall.

## **CASH FLOW**

The profits are excessive in another sense. They are so large that the industry simply cannot or will not reinvest them

**EXHIBIT II-2:  
RETURN ON EQUITY FRS COMPANIES AND S&P INDUSTRIALS  
1973-2005**

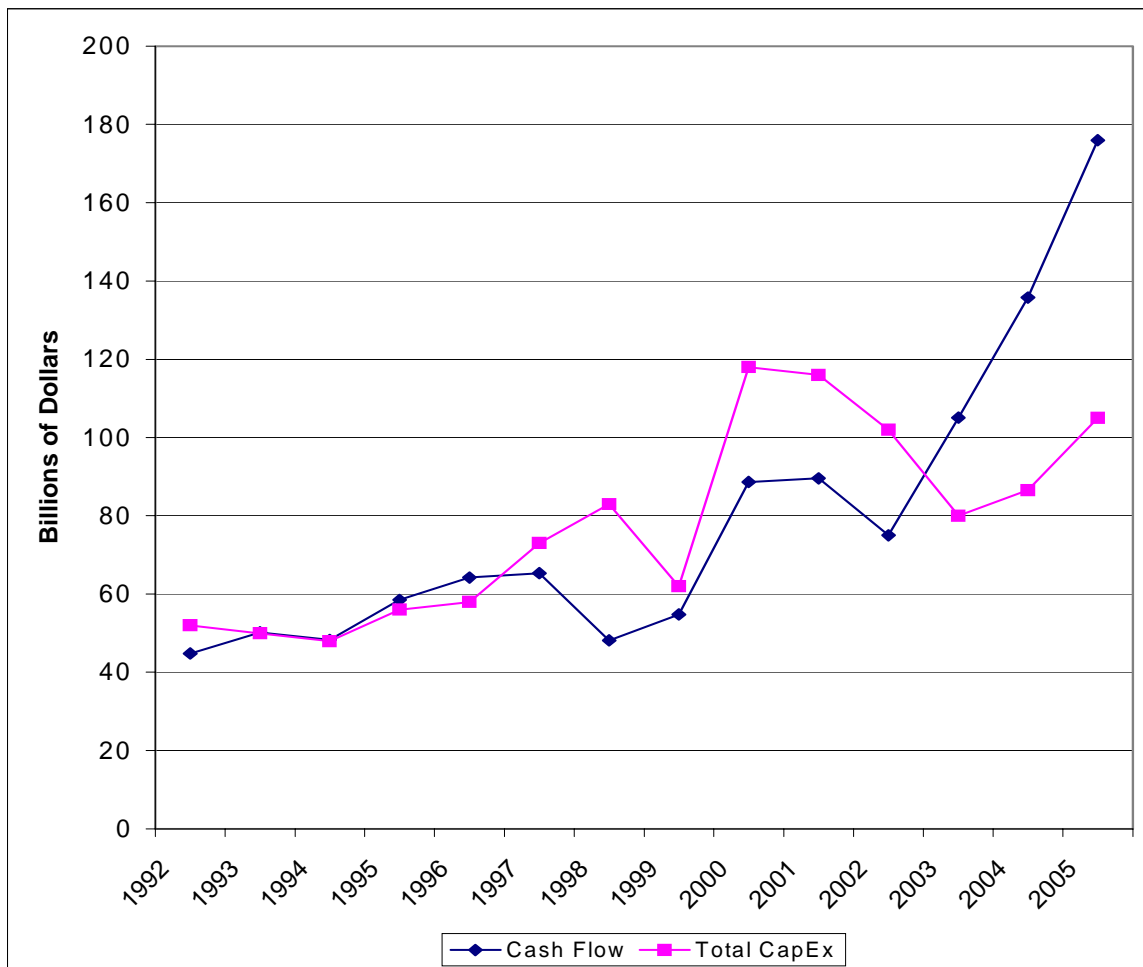


Source: Energy Information Administration, *Performance Profiles of Major Energy Producers: 2004*, March 2006, p. 3 for 1973-2004. 2005 estimated based on Energy Information Administration, *Financial News for Major Energy Companies, Fourth Quarter 2005*, *Financial News for Independent Energy Companies, Fourth Quarter 2005*; and Standard and Poors.

in the business (see Exhibit II-3). The cash flow of the companies, made up primarily of net income plus depreciation, has also skyrocketed. Capital expenditures have not.

The increase in cash flow above capital expenditures since 2000 has been just over \$100 billion. The three American

**EXHIBIT II-3:  
CASH FLOW AND CAPITAL EXPENDITURES**



Source: Energy Information Administration, *Performance Profiles of Major Energy Producers*, various issues; *Annual Reports*.

majors (ExxonMobil, Chevron Texaco, Conoco Phillips), alone increased their cash on hand by \$30 billion, they increased their total current assets by \$67 billion and they bought back \$35 billion of stock in the 2001-2005 period. Thus, \$100 billion is a good estimate of the excessive profits of the oil companies over the period.

### III. STRUCTURAL CONDITIONS IN PHYSICAL MARKETS

#### STRUCTURAL CONSOLIDATION

As noted in the natural gas report, energy demand is predictable in a seasonal pattern. A low elasticity of demand is a critical factor in rendering the energy market volatile and vulnerable to abuse. When demand is inelastic, consumers are vulnerable to price increases, since they cannot cut back on or find substitutes for their use of the commodity. When the most important market force in disciplining market power, demand elasticity, is as low as observed for gasoline, there are many opportunities to exercise and exploit market power.

The key to exploiting these opportunities is on the supply-side. To better understand what is going on with gasoline prices, we must look back over the last decade and chronicle the mergers that swept through the industry. The mergers eliminated competition and resulted in refinery closings, which tightened the market. This tightness was reinforced with the oil industry's long-term refusals to build new refineries and reductions in storage of product.

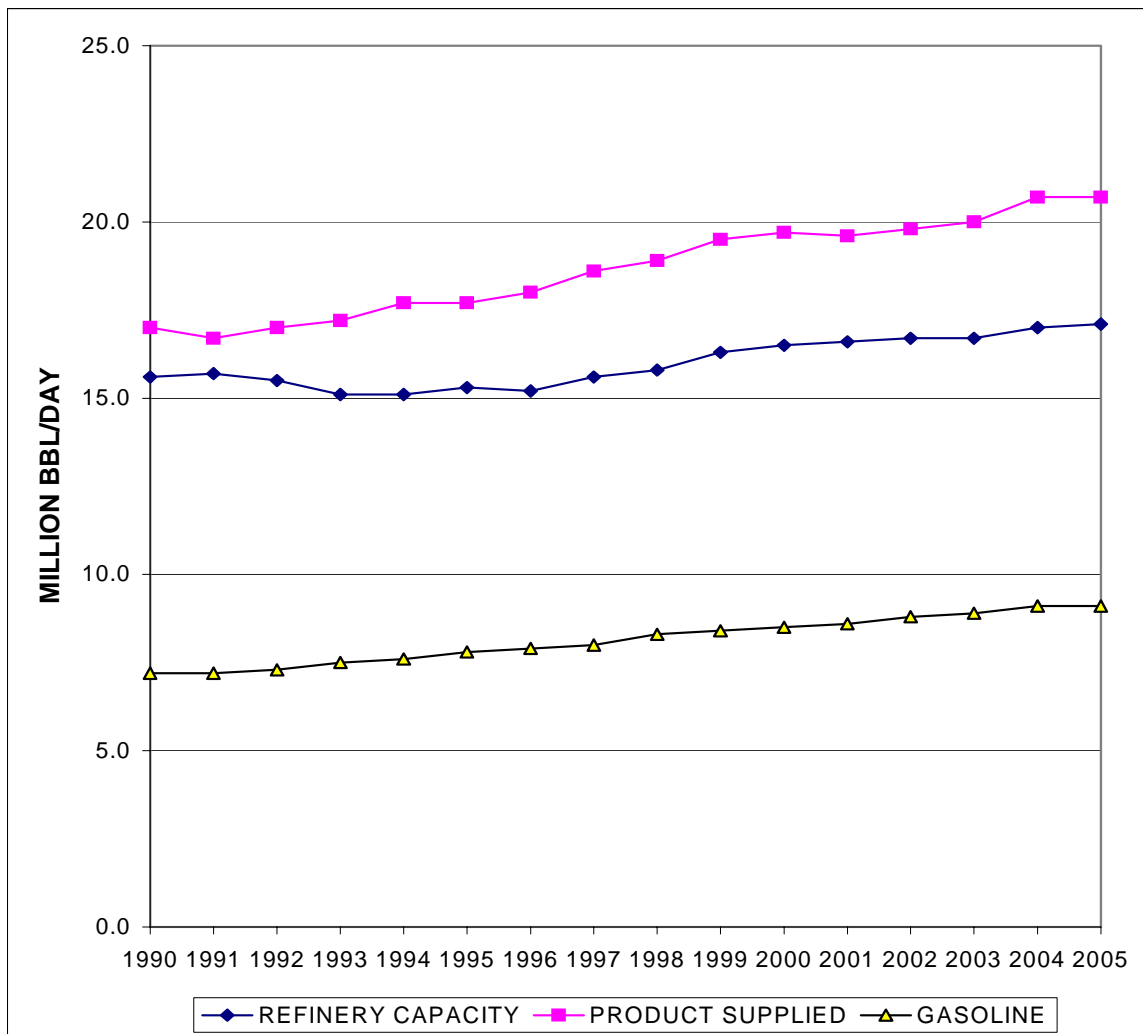
As a result of the merger wave described above, four out of the five regional refining markets and 47 out of 50 state wholesale gasoline markets (including Wisconsin) are now concentrated. By the standard measure economists use to measure market concentration - the Herfindahl Hirschmann Index - the regional refining market in which Wisconsin is located experienced the largest increase in concentration in the nation from 1990 to 2004. Concentration of the state wholesale gasoline market also increased more than the national average. Both of these levels of concentration are approaching the highly concentrated level that can result in anticompetitive situations. For a product like gasoline, where the elasticity of demand is low, this level of concentration is a severe problem.<sup>10</sup>

Federal antitrust authorities say that oil companies have not colluded. They don't have to. The industry has become so concentrated, the capacity has become so restricted, the barriers to entry are so large, and demand is so inelastic that they do not have to collude to raise the price level. Each

company acts individually and with confidence that its brethren will act in a parallel way.

Over the course of the past fifteen years the oil companies have closed over 50 refineries. The industry reminds us that existing refineries have expanded, but clearly not enough to build the spare capacity to put downward pressures on prices. (See Exhibit III-1) In the past 15 years, the petroleum product supplied to the U.S. market has increased

**EXHIBIT III-1:  
REFINERY CAPACITY AND PRODUCT SUPPLIED**



Source: Energy Information Administration, Petroleum Database.

twice as fast as refining capacity and gasoline consumption has increased over two and a half times as fast.

At the same time, the industry has reduced the amount of product it keeps in storage, relative to demand. (See Exhibit III-2) While gasoline product supplied to the market has increased by over 20 percent, the average amount of gasoline and blending components in storage has decreased by 6 percent. The industry chooses to keep so little spare capacities that they cannot even do spring-cleaning and maintenance on their refineries without causing price run-ups.

Mergers between major oil companies played a key role in the tightening of the gasoline market. These mergers resulted in consolidation of refinery and storage capacity as "redundant" facilities were eliminated. Even the National Energy Policy Development Group recognized that the reduction in capacity was the result of business decisions of oil companies. Government did not choose to close refineries and carry much lower stocks, private businesses did:<sup>11</sup>

Ongoing industry consolidation, in an effort to improve profitability, inevitably leads to the sale or closure of redundant facilities by the new combined ownership. This has been particularly true of terminal facilities, which can lead to reductions in inventory and system flexibility.<sup>12</sup>

By traditional standards, the wave of industry mergers noted above has resulted in a level of concentration that creates the basis for business behaviors and strategies that can exploit market power.<sup>13</sup>

The GAO found that "[c]oncentration in the wholesale gasoline market increased substantially from the mid-1990s so that by 2002, most states had either moderately or highly concentrated wholesale gasoline markets."<sup>14</sup>

The previous discussion focuses on horizontal concentration. Vertical integration between segments of the industry may have an impact as well. The GAO provides a detailed description of the changes in gasoline marketing that have worked to diminish competition.<sup>15</sup>

Vertical integration by dominant firms may create a barrier to entry requiring entry at two stages of production,<sup>16</sup> or foreclosing critical inputs for competitors in downstream markets.<sup>17</sup> Vertical arrangements may restrict the ability of downstream operators to respond to local market conditions.<sup>18</sup> Vertical integration not only removes important potential competitors across stages of production,<sup>19</sup> but also may trigger a wave of integrative mergers,<sup>20</sup> rendering small independents at any stage extremely vulnerable to a variety of attacks.<sup>21</sup> GAO found evidence here as well:

Anecdotal evidence and economic analysis by some industry experts suggest that mergers not only affected market concentration but also enhanced vertical integration and barriers to entry... At the wholesale and retail marketing levels, industry officials point out that mergers may have exacerbated barriers to entry in some markets. For example, the officials noted that mergers have contributed to a situation where pipelines and terminals are owned by fewer, mostly integrated companies that sometimes deny access to third party users, especially when supply is tight which creates a disincentive for potential new entrants into such wholesale markets.<sup>22</sup>

Gasoline markets are also vulnerable to the negative effects of vertical integration. Product must move downstream from the refinery or the tanker to the pump. Vertically integrated operations are closed to independent sources of supply. They may impose zonal pricing formulas or restrictions on sources of supply on their distribution outlets.<sup>23</sup> With vertical integration, the market may be less responsive than it could be both in the short term, since competing product has difficulty getting into individual markets at the end of a vertically integrated chain,<sup>24</sup> and in the long term, because new competitors in any market may have to enter at several stages of the business. Others have found that both horizontal concentration and vertical integration are associated with high prices.<sup>25</sup>

In light of these findings, the integration of refining and distribution is important. The integrated companies also appear to be more regionalized.<sup>26</sup> Each company covers a smaller area more densely, resulting in less competition.

## BEHAVIORAL CHANGES

Thus, the merger process reinforced the tendency for refiners to limit production capacity to meet only internal needs, a process which a March 2001 Federal Trade Commission (FTC) report authored by Chairman Robert Pitofsky noted in response to the mid-2000 gasoline price spike. By withholding supply, industry was able to drive prices up, and thereby increase profits.<sup>27</sup> The FTC identified the complex factors in the spike and issued a warning:

The spike appears to have been caused by a mixture of structural and operating decisions made previously (high capacity utilization, low inventory levels, the choice of ethanol as an oxygenate), unexpected occurrences (pipeline breaks, production difficulties), errors by refiners in forecasting industry supply (misestimating supply, slow reactions), and decisions by firms to maximize their profits (curtailing production, keeping available supply off the market). The damage was ultimately limited by the ability of the industry to respond to the price spike within three or four weeks with increased supply of products. However, if the problem was short-term, so too was the resolution, and similar price spikes are capable of replication. Unless gasoline demand abates or refining capacity grows, price spikes are likely to occur in the future in the Midwest and other areas of the country.<sup>28</sup>

The more recent GAO report reached a similar conclusion.

The second change identified by industry officials is that refiners now prefer dealing with large distributors and retailers.<sup>29</sup>

Consolidation at the refining level has allowed large refiners to dictate the terms of supply contracts, including minimum volume requirements.<sup>30</sup>

Distributors said that refiners who supply them with branded gasoline preclude them from operating stations within certain proximities of major metropolitan markets where the refiners generally



prefer to locate their company-owned and operated and lessee dealer stations.<sup>31</sup>

With increasing concentration, long-term strategic decisions by the industry about production capacity interact with short-term (mis)management of stocks to create a tight supply situation that provides ample opportunities to push prices up quickly. Because there are few firms in the market and because consumers cannot easily cut back on energy consumption, prices hold above competitive levels for significant periods of time.

The prominent role of business decisions in reducing capacity raises the concern that these decisions are intended to reduce competitive market forces and secure market power for major industry players. While mergers and acquisitions or facility closings are nominally justified by claims of efficiency gains,<sup>32</sup> they have the real economic effect of reducing competition.

Documents from the mid-1990s indicate that industry officials and corporate officers were concerned about how to reduce capacity, with observations such as "if the U.S. petroleum industry doesn't reduce its refining capacity, it will never see any substantial increase in refinery profits," from a Chevron Corporation document written in November 1995. A Texaco official, in a March 1996 memorandum, said refinery overcapacity was "the most critical factor" facing the industry and was responsible for "very poor refining financial results."<sup>33</sup>

A 2003 RAND study of the refinery sector reaffirmed the importance of the decisions to restrict supply. It pointed out a change in attitude in the industry, wherein "[i]ncreasing capacity and output to gain market share or to offset the cost of regulatory upgrades is now frowned upon."<sup>34</sup> In its place we find a "more discriminating approach to investment and supplying the market that emphasized maximizing margins and returns on investment rather than product output or market share."<sup>35</sup> The central tactic is to allow markets to become tight by "relying on... existing plant and equipment to the greatest possible extent, even if that ultimately meant curtailing output of certain refined product."<sup>36</sup>

Indeed, many RAND discussants openly questioned the once-universal imperative of a refinery not "going short" - that is, not having enough product to meet market demand. Rather than investing in and operating refineries to ensure that markets are fully supplied all the time, refiners suggested that they were focusing first on ensuring that their branded retailers are adequately supplied by curtailing sales to wholesale markets, if needed.<sup>37</sup> The RAND study drew a direct link between long-term structural changes and the behavioral changes in the industry, drawing the connection between business strategies to increase profitability and pricing volatility. It issued the same warning that the FTC had offered two years earlier:

For operating companies, the elimination of excess capacity represents a significant business accomplishment: low profits in the 1980s and 1990s were blamed in part on overcapacity in the sector. Since the mid-1990s, economic performance industry-wide has recovered and reached record levels in 2001. On the other hand, for consumers, the elimination of spare capacity generates upward pressure on prices at the pump and produces short-term market vulnerabilities. Disruptions in refinery operations resulting from scheduled maintenance and overhauls or unscheduled breakdowns are more likely to lead to acute (i.e., measured in weeks) supply shortfalls and price spikes.<sup>38</sup>

The structural conditions in the domestic gasoline industry have only gotten worse as demand continues to grow and mergers have been consummated. The increases in prices and industry profits should come as no surprise. The spikes in the refiner and marketer take at the pump in 2002, 2003 and early 2004 were larger than the 2000 spike that was studied by the FTC. The weeks of elevated prices now stretch into months. The market does not correct itself. The roller coaster has become a ratchet.

A recent comment by the chairman of ExxonMobil reported in the *Wall Street Journal* makes it clear that the industry continues to behave in this anticompetitive, anti-consumer manner and will do nothing to alleviate the pressure on the refining market:

Exxon Mobil Corp. says it believes that, by 2030, hybrid gasoline-and-electric cars and light trucks will account for nearly 30% of new vehicle sales in the U.S. and Canada. That surge is part of a broader shift toward fuel efficiency that Exxon thinks will cause fuel consumption by North American cars and light trucks to peak around 2020 - and then start to fall.

"For that reason, we wouldn't build a grassroots refinery," in the U.S. Rex Tillerson, Exxon's chairman and chief executive, said in a recent interview. Exxon has continued to expand the capacity of its existing refineries. But a new refinery from scratch, Exxon believes, would be bad for long-term business.<sup>39</sup>

When supply and demand elasticities are so low, companies have greater market power over price at lower levels of concentration. Refinery expansion has not been sufficient to alleviate the pressure on price, and this business strategy is likely to keep it that way for at least a decade.

This pattern of behavior is not restricted to investments in refining. As *The Wall Street Journal* noted in mid-2004, "with prices soaring as much as 50%...oil Titans from Texas to Tehran are awash in record revenue. But as the money floods in, they are spending little extra in finding and extracting more petroleum."<sup>40</sup> Just as we have seen in the refining sector, where companies will not invest to expand refinery capacity that might put downward pressure on prices, the same mentality afflicts the companies in the production sector.

The companies call it "capital discipline,"<sup>41</sup> but it means a tight market and a permanent condition of excess profits. *The Wall Street Journal* cites a Chevron/Texaco spokesperson, defending the fact that "the company has made no major shifts in investment plans because of the price boom. 'Our long-term price guidelines are around the low \$20s' for U.S. benchmark crude."<sup>42</sup> The *Journal* points out that this is "well below the average of \$29 at which oil has traded since 2000."<sup>43</sup> The result of the refusal to invest in production capacity has "led to one of the biggest potential disconnects between supply and demand in the 150-year history of the oil business."<sup>44</sup>

Other industry analysts have similar concerns:

For several years oil producers have proved reluctant to match their spending to expected demand, says John Westwood, chief executive of British energy industry consultant Douglas-Westwood. Mr. Westwood traces part of the dearth in spending to oil companies' recent merger binge, where they bought growth through acquisitions rather than exploration...As far as we're concerned, this is not a real [supply] crunch. This is just a practice.<sup>45</sup>

The *New York Times* underscored the consternation of some with a front page headline "An Oil Enigma: Production Falls Even as Reserves Rise: No Clear Picture Emerges to Explain Discrepancy."<sup>46</sup> Ironically, it selected Chevron/Texaco to illustrate the fact that oil companies were producing less of their reserves. The turning point was 2000.

## IV. FINANCIAL MARKETS

### VOLUME, VOLATILITY AND RISK

As noted, on April 29, 2006 the *New York Times* ran a front-page article under the headline "Trading Frenzy Adds to Jump in Price of Oil." The article described the upward price spiral for oil in exactly the terms we used to describe the upward price spiral in our recent natural gas report. In the natural gas report we examined the trade press to add a layer of detail to the behavioral dynamics of these markets. In this case, the *Times* article provides that level of analysis.

The *Times* article opens with a brief paragraph on the conditions in the physical market but then devotes about 36 column inches to the proposition that financial markets are adding to the price increase.

"A global economic boom, sharply higher demand and domestic instability in many of the world's top oil-producing countries - in that environment higher oil prices were inevitable.

But crude oil is not merely a physical commodity... It has also become a valuable financial asset, bought and sold in electronic exchanges by traders around the world. And they, too, have helped push prices higher.

A recent report on natural gas prices produced for Wisconsin and three other upper-Midwest states presents a rigorous analytic framework for understanding the complex process that is afflicting the energy sector.

Chapter Two of the report lays out a similar physical market situation. In the analysis of the natural gas market it was found that, although markets were tight, there was no increase in demand. In the gasoline market we have found a modest increase in demand, but the central anomaly is still striking - physical market conditions cannot explain financial market behaviors - "It is the case," according to BP's chief executive, Lord Browne, "that the price of oil has gone up while nothing has changed physically."

"Gold prices do not go up because jewelers need more gold, they go up because gold is an investment," said Roger Diwan, a partner with PFC Energy, a Washington-based consultant. "The same has happened to oil."

Three key factors serve to drive the price spiral higher: volume, volatility and risk. To that end, we briefly review the account the *Times* presented and point to the rigorous analytic framework and empirical evidence provided in the report.

The structure and availability of markets plays a role in allowing the volumes to increase.

Changes in the way oil is traded have contributed their part as well. On NYMEX, oil contracts held mostly by hedge funds - essentially private investment vehicles for the wealthy and institutions, run by traders who share risk and reward with their partners - rose above one billion barrels this month, twice the amount held five years ago.

Beyond that, trading has also increased outside official exchanges, including swaps or over-the-counter trades conducted directly between, say, a bank and an airline...

Such trading is a 24-hour business. And more sophisticated electronic technology allows more money to pour into oil, quicker than ever before, from anywhere in the world.

The influx of new money is sustained by movements of different institutions and individuals into the market.

"Everybody is jumping into commodities and there is a log of cash chasing oil," said Philip K. Verleger Jr., a consultant and former senior advisor on energy policy at the Treasury Department.

The hedge funds have come roaring into the commodities market, and they are willing to take risks," said Brad Hintz, an analyst with Sanford Burnstein & Company, an investment firm in New York...

Pension funds have been particularly active in the last year, said Frederic Lasserre, the head of commodity research at Societe Generale in Paris. These investors, seeking to diversify their portfolios have added to the buying pressure on limited commodity markets.

This fundamental observation had been offered a couple of years earlier in a front page *Wall Street Journal* story entitled, "Oil Brings Surge in Speculators Betting on Prices: Large Investors Playing Ongoing Rise is Increasing Demand and Price Itself:"<sup>47</sup>

Oil has become a speculator's paradise. Surging energy prices have attracted a horde of investors - and their feverish betting on rising prices has itself contributed to the climb.

These investors have driven up volume on commodities' exchanges and prompted a large push among Wall Street banks and brokerage firms to beef up energy trading capabilities. As the action picked up in the past year, those profiting include large, well-known hedge funds, an emerging group of high-rollers, as well as descendants of once-high flying energy-trading shops such as Enron Corp...

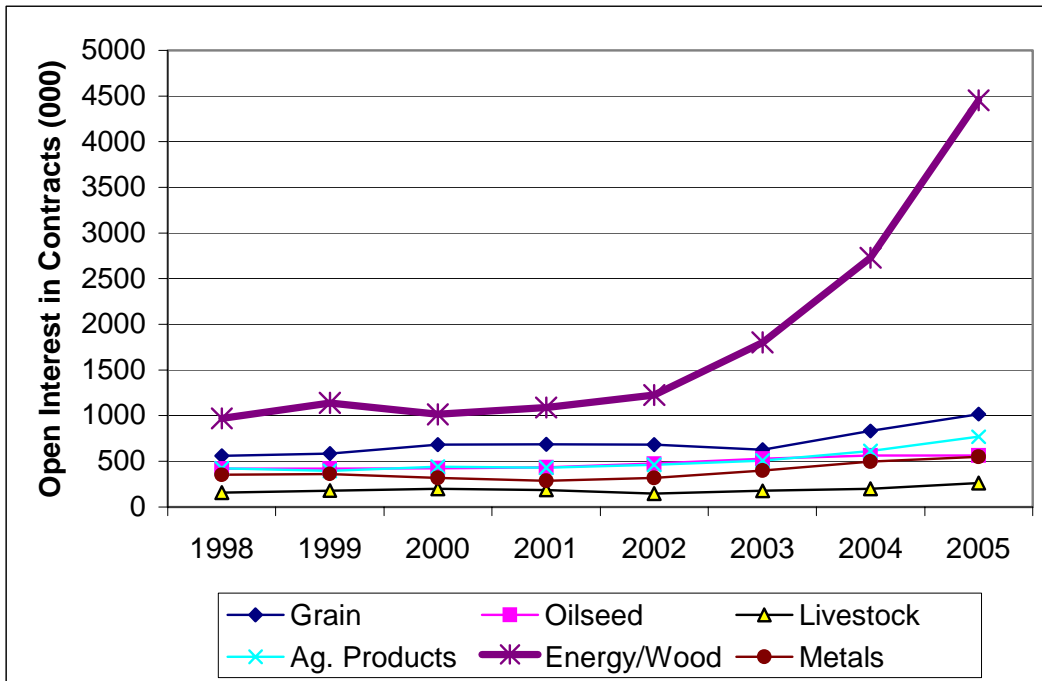
The notion is that the continual influx of money represents too much money chasing too few goods. Exhibit IV-1, shows the dramatic increase in trading associated with energy commodities.

In the *Wall Street Journal* article from 2004, Alan Greenspan offered precisely this view of what had begun to happen in the financial markets:

"The marked rise in the net long positions of noncommercial investors in oil futures and options since May 2003 has increased net claims on an already diminished global level of commercial crude and product inventories," said Federal Reserve Chairman Alan Greenspan in June of this year. Oil prices accordingly have surged."<sup>48</sup>

The increase in Exhibit IV-1 is the volume of contracts. The value of contracts also increased dramatically. Combined, the increase in total value is almost tenfold. Put another way, the value of trading increased about \$7 billion per month, every month for three years.

**EXHIBIT IV-1:  
COMMODITY TRADING OF NON-FINANCIAL INSTRUMENTS  
(Average Month-end Open Interest)**



Source: Commodity Future Trading Commission, Annual Reports: Futures Statistics by Major Commodity Group.

One characteristic of today's futures market is a sharp increase in volatility, which industry insiders largely attribute to hedge funds and other speculators looking for a quick profit. And while the explosion of oil trading activity in the financial markets has created greater liquidity for oil, that liquidity is expensive.

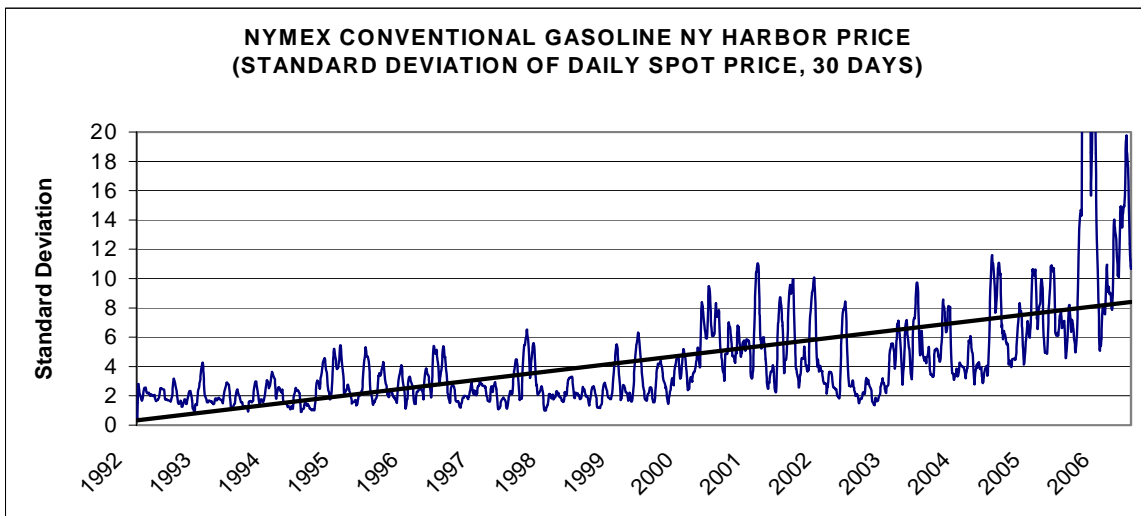
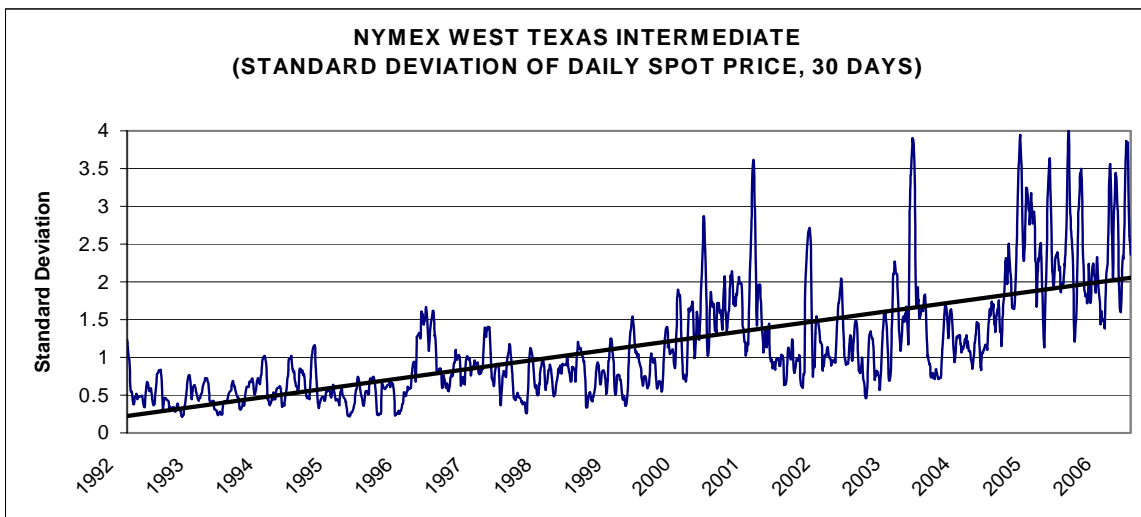
All this new money has contributed to higher prices, by some estimates perhaps as much as 10 to 20 percent.



Volatility and risk have increased in the oil market (see Exhibit IV-2). Traders demand to be rewarded for taking risks and want to be insulated from volatility. The owners of the physical commodity increase the price they demand as compensation for parting with a barrel of oil.

It may be true that the influx of cash will stop at some point and the financial markets will have to unwind from their

**EXHIBIT IV-2:  
CRUDE OIL AND GASOLINE VOLATILITY**



Source: Energy Information Administration, *Petroleum Database*.

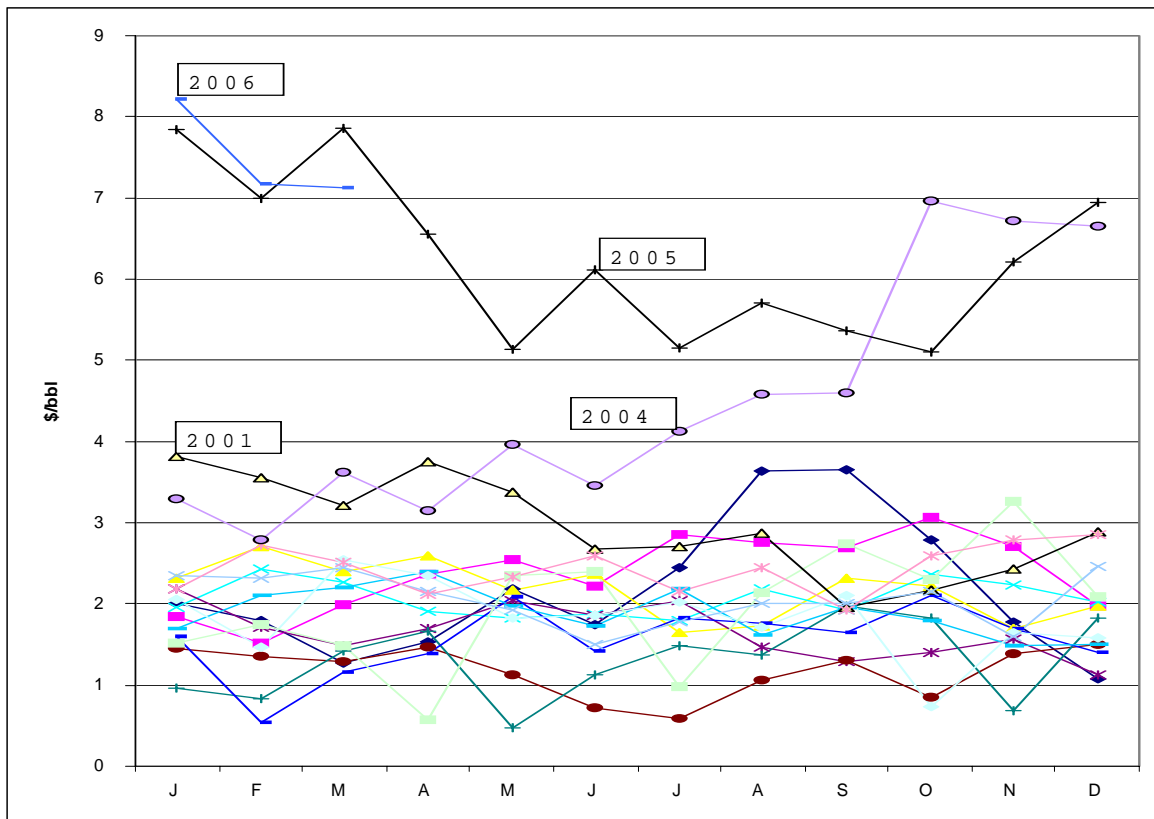
extremely high levels. However, we have observed a pattern that the price never seems to drop back down to costs. Moreover, the harm during the spiral is considerable. At \$15 dollar per barrel difference due to the trading frenzy costs (consistent with the 20% figure), this costs American consumers about \$10 billion dollars per month during the driving season.

**THE GAP BETWEEN FINANCIAL AND PHYSICAL MARKETS**

In energy markets, there appears to be a disconnect between the physical market and the futures market. In the oil market, there is no doubt that current market prices are far above the cost of production.

What is more interesting is the growing disconnect between the financial markets and the wellhead price.<sup>49</sup> As Exhibit IV-3 shows, the gap between the NYMEX benchmark and the refiner

**EXHIBIT IV-3:  
SPOT PRICE MINUS REFINER ACQUISITION COST**

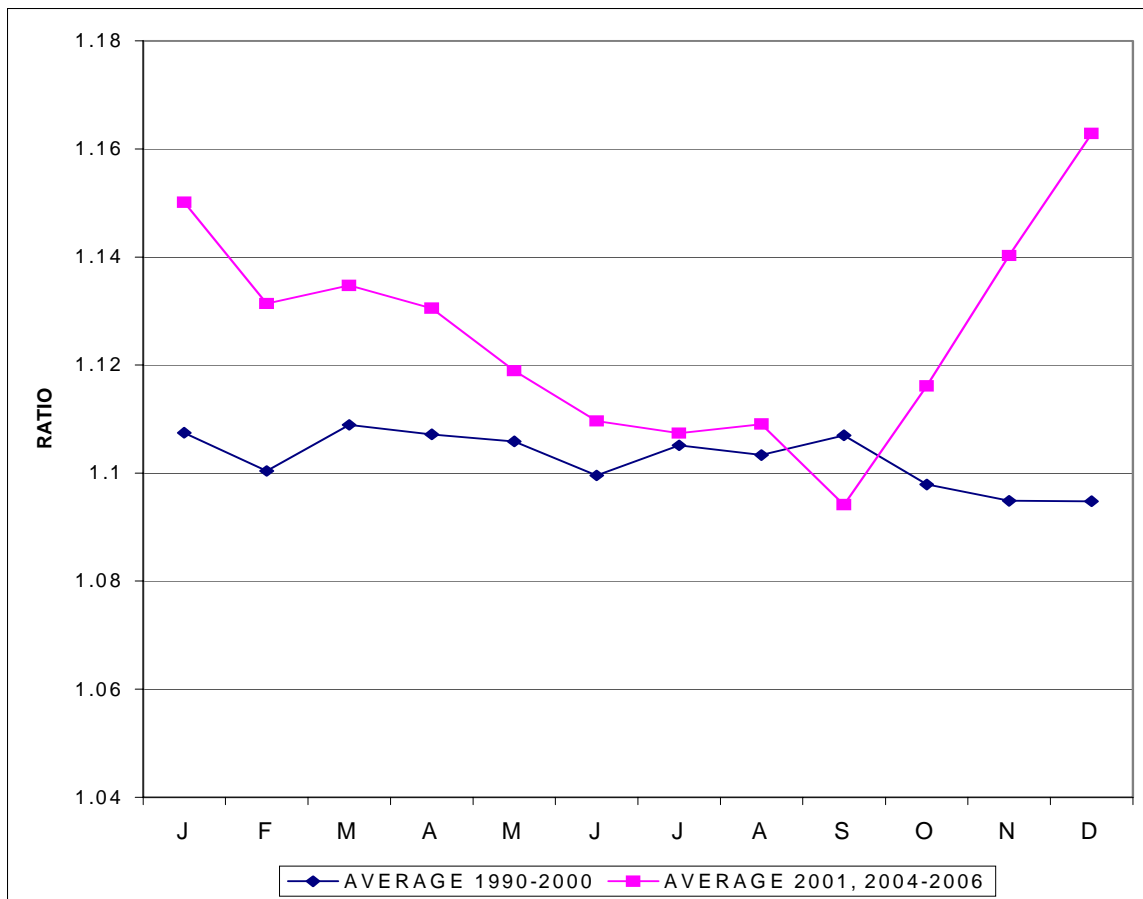


SOURCE: Energy Information Administration, Petroleum Database.

acquisition cost of crude escalates during trading frenzies. Between 1990 and 2000, the difference generally fell in a narrow range of \$1 to \$2.50 per barrel. It was well above that in 2001. In 2004 the gap began to mount steadily averaging almost \$6 in 2005 and over \$7 in early 2006. On a percentage basis, the difference is not as dramatic, but nevertheless substantial (see Exhibit IV-4).

Each of the factors cited in the *Times* article as contributing to the increase in price is challenged by a financial market purist under the claim that these markets cannot possibly do that, just as the market purists claimed for years that nothing was wrong with the California electricity market. But there is growing empirical evidence that the

**EXHIBIT IV-4:  
RATIO OF SPOT PRICE TO REFINER ACQUISITION PRICE**



Source: Energy Information Administration, *Petroleum Database*.

physical fundamentals simply do not support the price behavior of energy commodities and that a huge gap has grown between the cost of production and the prices being paid. As this problem becomes more and more evident, Federal policymakers who have responsibility to oversee these markets may finally be forced to open their eyes to the reality.

## **V. RECOMMENDATIONS**

Over the past six years we frequently heard the claim that this is just a market, just supply and demand. That is not the case. If competitive forces of supply and demand were operating as they should, there would be 15 million barrels more capacity in the world crude oil market, at least 3 million barrels more capacity in the domestic refinery market, and the price of a gallon of gasoline would be closer to \$1.50, not hovering around \$3.00. The price of gasoline is set in a market that has been rigged by political and financial decisions and strategic behaviors.

The oil industry has made it clear that it will not build sufficient capacity to put downward pressure on prices. Having achieved market power through consolidation and strategic under-investment, it is not likely to give it up easily. This is true in both the refining and crude oil sector. Oil company annual reports talk about disciplined capital spending, which means restrained investment.

### **LONG-TERM CHANGE IN MARKET FUNDAMENTALS**

Long-term structural change to alleviate pressure on the gasoline market must come from outside of the industry. There are two primary possibilities here - reduction of demand and increased use of alternative fuels.

The key long-term structural change that will alleviate the pressure on the gasoline market is to increase the fuel efficiency of the U.S. vehicle fleet. For almost a decade and a half, the average fuel economy of the fleet has been stagnant. A 2002 report from the National Research Council identified two dozen measures that could be taken to increase fuel efficiency with off-the-shelf technologies. The technological potential exists to improve fuel efficiency for new vehicles (cars and light trucks) from the current average of 25 miles per gallon to 50 miles per gallon, at costs that will not increase the total cost of owning a vehicle for the consumer. That is, the increase in the purchase price of the vehicle is offset by the reduced cost of gasoline (at \$3.00 per gallon). This would be the single most important thing America

could do to reduce its oil consumption and its dependence on imports.

On the supply-side, biofuels - ethanol and biodiesel - could displace a significant quantity of oil consumption. Biofuels have three characteristics that make them attractive as a strategy for reducing oil consumption and also relieving pressure on prices - new resources, new facilities and new entrants.

- The production of biofuels involves a different raw material input. Corn (or switch grass) competes with crude.
- The construction of ethanol and biodiesel plants adds capacity to the industry. Ethanol plants compete with refineries.
- The owners of these plants tend not to be members of the world oil cartel/oligopoly.

#### **MARKET OVERSIGHT**

Petroleum markets will continue to play a key role in the nation's economy for decades to come, even if aggressive policies are pursued to alleviate the tight supply conditions.

Financial markets for energy commodities require more oversight. At a minimum the public deserves an intensive examination of every aspect of the petroleum market. Such an examination would suggest that more authority be vested in responsible institutions, given that the vast majority of current transactions are beyond regulatory jurisdiction.

Ongoing scrutiny would require that traders in all energy markets register and report. Traders should be competent, honest people. They should be required to register, like bankers do. They should have the resources to meet their commitments and stand behind their trades, as bankers are required to do. Regulators should be able to see all markets so they can detect efforts to move any individual market, which means large transactions and positions should be reported. Above all, oversight should apply to all markets. The opaqueness created by the presence of completely unregulated traders should be eliminated.

Future monitoring activities may not be sufficient to ensure that energy commodity markets operate efficiently and equitably. The nature of the underlying commodity is such that it is especially vulnerable. Policies can be structured to avoid trading abuses. The objective is to diminish the ability to move the market at key moments.

Position limits would make it difficult to control a sufficient quantity of the commodity to influence the price. Larger margin requirements can reduce the volume of trading. Preferential access to trading markets should not be allowed, as this gives an advantage to speculators.

#### **EXPANDED ANTITRUST AUTHORITY**

While inadequate federal antitrust laws and lax federal antitrust enforcement have allowed the current flawed industry structure to come about by allowing the high level of mergers, simply enforcing the antitrust laws going forward will not solve the problem. The industry has become so concentrated and market forces (supply and demand elasticities) are so weak that structural changes are needed.

The states should push federal agencies and Congress to establish joint federal-state task forces to oversee these vital markets. More oversight of these markets will help to identify abuse.

Because of weak market forces (e.g., low supply and inelastic demand) that typify energy markets, and strategic actions by major oil companies to tighten domestic refining and natural gas markets, unilateral action by and conscious parallelism among the small number of major oil companies has given them market power over prices. Antitrust authorities must subject this conduct to scrutiny that is not currently effective under the antitrust laws.

#### **STATE ACTIONS**

States are generally precluded from enacting policies that regulate the gasoline consumption of the vehicles sold within the state. The state should call on the federal government to remove the preemption of state action so that states can

explore more effective ways to promote fuel efficiency in the vehicle fleet.

Even under current law, creative approaches should be explored. For example, states could provide a sliding scale tax credit for purchases of vehicles with high fuel-efficiency ratings. Moreover, states are not precluded from enacting policies to reduce greenhouse gas emissions. There is a nearly perfect correlation between fuel consumption and greenhouse gas emissions. Legislation is moving in California that would set up a clean car incentive program that collects higher taxes on high-emission vehicles and provides rebates for low-emission vehicles.

Price gouging by gasoline stations does not appear to have been a widespread phenomenon, when compared to the price gouging by refiners. Nevertheless, the Attorney General should have the authority to take action against price gouging at the retail, wholesale and refinery levels.

In addition, a combined state-federal task force should be formed to examine critical questions about the role of major oil companies in limiting domestic refinery capacity.



## VI. CONCLUSION

For six years, as the cost of petroleum products has mounted, federal regulators, antitrust officials and policymakers who have the primary responsibility for the oversight over these markets have done little to address the growing problem. With gasoline prices hovering around \$3.00 per gallon and the increase in household spending on petroleum products exceeding \$2,000 per year, consumer outrage has finally caught the attention of Washington.

The crisis atmosphere may not be conducive to long-run thinking, but that is what is needed. The oil industry will not build for and cannot drill for a solution to the problem. Public policy must aggressively point the nation toward reduced demand and alternative sources of supply. It must also assure Americans that they are not being abused by strategic behavior in the physical markets or victimized by counterproductive frenzies of trading in financial markets brought on by lax regulation and oversight.

## ENDNOTES

<sup>1</sup> This is approximately the average price for January through April.

<sup>2</sup> Cooper, Mark, N., *The Role of Supply, Demand and Financial Commodity Markets in the Natural Gas Price Spiral*, prepared for Midwest Attorneys General Natural Gas Working Group (Illinois, Iowa, Missouri, Wisconsin, March 2006 (hereafter Natural Gas Report).

<sup>3</sup> Id., Chapter I.

<sup>4</sup> Energy Information Administration, *Summer 2003 Motor Gasoline Outlook* (Washington, April 2003), analyzes the spread.

<sup>5</sup> Natural Gas Report, p. 8.

<sup>6</sup> Espy, Molly, "Explaining the Variation in Elasticity Estimates of Gasoline Demand in the United States: A Meta-analysis," *The Energy Journal*, 17, 1996, Table 2, shows the average elasticity of demand for U.S. only studies at -.42. Espey, Molly, "Gasoline Demand Revisited: An International Meta-Analysis of Elasticities," *Energy Economics* 20, 1998, 273-295, identifies 363 estimates of short-term elasticity. The median is -.23 for the short term and -.43 for the long term. Kayser, Hilke A., "Gasoline Demand and Car Choice: Estimating Gasoline Demand Using Household Information," *Energy Economics*, 22, 2000, estimated the short-term elasticity in the U.S. at -.23. Puller, Steven L. and Lorna A. Greening, "Household Adjustment to Gasoline Price Change: An Analysis Using 9 Years of US Survey Data," *Energy Economics*, 21, 1999, pp. 37-52, find a one-year price elasticity of -.34, but model a more complex structure of responses within shorter periods. They find a larger elasticity of miles traveled in the first quarter after a price shock (-.69 to -.76), but that demand "snaps back." The larger reduction in miles driven is still "inelastic." Moreover, the reduction in miles driven is larger than the reduction in fuel consumed since it appears that households cut back on the most efficient driving miles (i.e. higher speed vacation miles).

<sup>7</sup> Energy Information Administration, *This Week in Petroleum*, May 3, 2006, p. 2. "In other words, if U.S. gasoline markets are tight, they may 'pull up' crude oil prices to a degree, given that tight downstream capacity makes each gallon of product produced that much more valuable, increasing the value of the crude used to produce the refined product."

<sup>8</sup> April 29, 2006, p. A-1.

<sup>9</sup> Energy Information Administration, *Performance Profiles of Major Energy Producers: 2004*, March 2006, p. 2.

<sup>10</sup> Cooper, Mark, N., *Record Prices, Record Oil Company Profits: The Failure of Antitrust Enforcement to Protect American Energy Consumers*, Antitrust Section of the American Bar Association, Washington, D.C., April 1, 2005.

<sup>11</sup> Federal Trade Commission, *Midwest Gasoline*, note 23, citing Organization for Economic Co-operation and Development and Department of Energy documents states, "Higher crude prices led producers to draw down inventories in anticipation of replacing them later at lower prices."

<sup>12</sup> National Energy Policy Development Group, *National Energy Policy* (Washington, May 2001), p. 7-13 (hereafter NEPDG).

<sup>13</sup> General Accountability Office, *Energy Markets: Effects of Mergers and Market Concentration in the U.S. Petroleum Industry* (Washington, May 2004) (hereafter, GAO). p. 5.

<sup>14</sup> GAO, p. 5.

<sup>15</sup> GAO, p. 9, 76.

<sup>16</sup> Scherer, F. M. and David Ross, *Industrial Market Structure and Economic Performance* (Boston: Houghton Mifflin, 1990), p. 526, formulate the issue as follows "To avoid these hazards, firms entering either of the markets in question might feel compelled to enter both, increasing the amount of capital investment required for entry."

<sup>17</sup> Shepherd, William G., *The Economics of Industrial Organization* (Englewood Cliffs, NJ: Prentice Hall, 1985). pp. 289-290, describes this issue as follows:

When all production at a level of an industry is "in-house," no market at all exists from which independent firms can buy inputs. If they face impediments or delays in setting up a new

supplier, competition at their level will be reduced. The clearest form of this is the rise in capital a new entrant needs to set up at both levels.

Ores, special locations, or other indispensable inputs may be held by the integrated firm and withheld from others. The integration prevents the inputs from being offered in a market, and so outsiders are excluded. A rational integrated firm might choose to sell them at a sufficiently high price.

<sup>18</sup> Shepherd, p. 294, argues that integration by large firms creates this problem. Restrictions may be set on areas, prices or other dimensions ... Only when they are done by small-share firms may competition be increased. When done by leading firms with market shares above 20 percent, the restrictions do *reduce* competition.

<sup>19</sup> Perry, Martin K., "Vertical Integration: Determinants and Effects," in Schmalensee and Willig (eds.), *Handbook of Industrial Organization*, p. 197.

<sup>20</sup> Perry, p. 247.

<sup>21</sup> Scherer and Ross, pp. 526-527; Shepherd, p. 290.

<sup>22</sup> GAO, pp. 5 -9.

<sup>23</sup> Borenstein, Severin, A. Colin Cameron and Richard Gilbert, "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes?" *Quarterly Journal of Economics*, 1997.

<sup>24</sup> Scherer and Ross, pp. 526-527; Shepherd, p. 290.

<sup>25</sup> Gilbert, Richard and Justine Hastings, "Vertical Integration in Gasoline Supply: An Empirical Test of Raising Rivals' Costs" (Competition Policy Center, University of California, Berkeley, 2001), p. 27; see also Hastings, Justine, "Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California" (Competition Policy Center, University of California, Berkeley, 2000).

Upstream concentration is positively correlated with price, the market share of independents is negatively correlated with price and the average market share of the vertically integrated suppliers covaries positively with wholesale price...

Moreover, the incentive to raise price is also positively correlated with the geographic proximity of integrated stations to rival independents, indicating that the greater the degree of competition, or cross-price elasticity, between integrated retailers and rival independent retailers, the greater the integrated firm's incentive to raise rivals' wholesale costs

<sup>26</sup> In 1990, 22 integrated companies covered an average of 28 states. In 1999, 17 companies covered an average of 26 states.

<sup>27</sup> Federal Trade Commission, *Midwest Gasoline Price Investigation* (Washington, March 29, 2001).

<sup>28</sup> Federal Trade Commission, *Midwest Gasoline*, pp. i... 4.

<sup>29</sup> GAO, p. 5.

<sup>30</sup> GAO, p. 77.

<sup>31</sup> GAO, p. 73.

<sup>32</sup> They certainly have value on the stock market (see Edwards, Kenneth, John D. Jackson and Henry L. Thompson, "A Note on Vertical Integration and Stock Ratings of Oil Companies in the U.S.," *The Energy Journal*, 2000).

<sup>33</sup> "Oil Data Show Industry Role in Shortages a Possibility," *The New York Times*, June 15, 2001.

<sup>34</sup> Peterson, D.J. and Sergej Mahnovski, *New Forces at Work in Refining: Industry Views of Critical Business and Operations Trends* (Santa Monica, CA: RAND Corporation, 2003), p. 16.

<sup>35</sup> Peterson and Mahnovski, p. 42.

<sup>36</sup> Peterson and Mahnovski, p. 17.

<sup>37</sup> Peterson and Mahnovski, p. 17.

<sup>38</sup> Peterson and Mahnovski, p. xvi.

<sup>39</sup> Ball, Jerry, "As Gasoline Prices Soar, Americans Resist Major Cuts in Consumption," *Wall Street Journal*, May 1, 2006, p. A13.

<sup>40</sup> “Awash in a Gusher of Cash, Oil firms Are Reluctant Investors,” *Wall Street Journal*, August 26, 2004, p. A-2.

<sup>41</sup> “Awash in a Gusher of Cash, Oil firms Are Reluctant Investors,” *Wall Street Journal*, August 26, 2004, p. A-2; ExxonMobil Annual Report 2005, p. 5; Chevron uses the term “capital discipline,” Annual Report 2005, p. 2.

<sup>42</sup> *Wall Street Journal*, Awash, p. A-2.

<sup>43</sup> *Wall Street Journal*, Awash, p. A-2.

<sup>44</sup> *Wall Street Journal*, Awash, p. A-1.

<sup>45</sup> Warren, Susan, “Oil Companies Curb Their Spending; Restraint Spurs Worries of Short Supplies in Future; Producers Stress Discipline,” *Wall Street Journal*, June 3, 2004.

<sup>46</sup> Berenson, Alex, June 12, 2004.

<sup>47</sup> August 24, 2004, p. A-1.

<sup>48</sup> Awash in Cash, p. A-2.

<sup>49</sup> At the House Energy and Commerce Hearing on May 10, 2006, Representative Cubin (R-WY) complained that producers in Wyoming received far less than the spot market price.