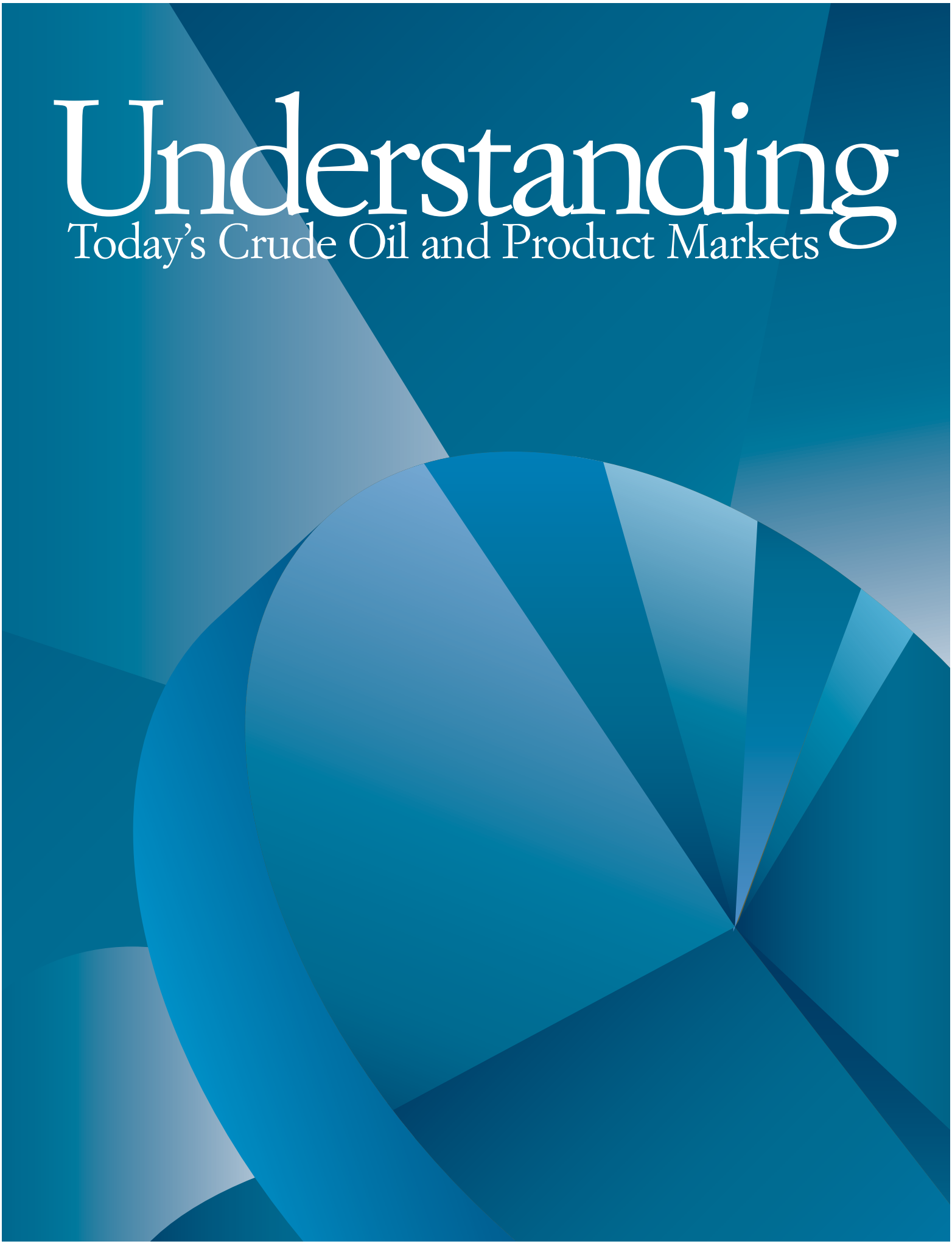
Understanding

Today's Crude Oil and Product Markets



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American consumers have found themselves facing higher prices for gasoline, heating oil, and other petroleum products. The question policymakers, as well as consumers, seek to answer is:

Why?

How is it that over the past few years, consumers have realized a sustained increase in the prices they pay for petroleum products that are critical to their economic well-being? What is it that has caused the price of crude oil to push past $70 per barrel? And how does this affect the cost of gasoline and other petroleum products?

First, let's start with the facts.

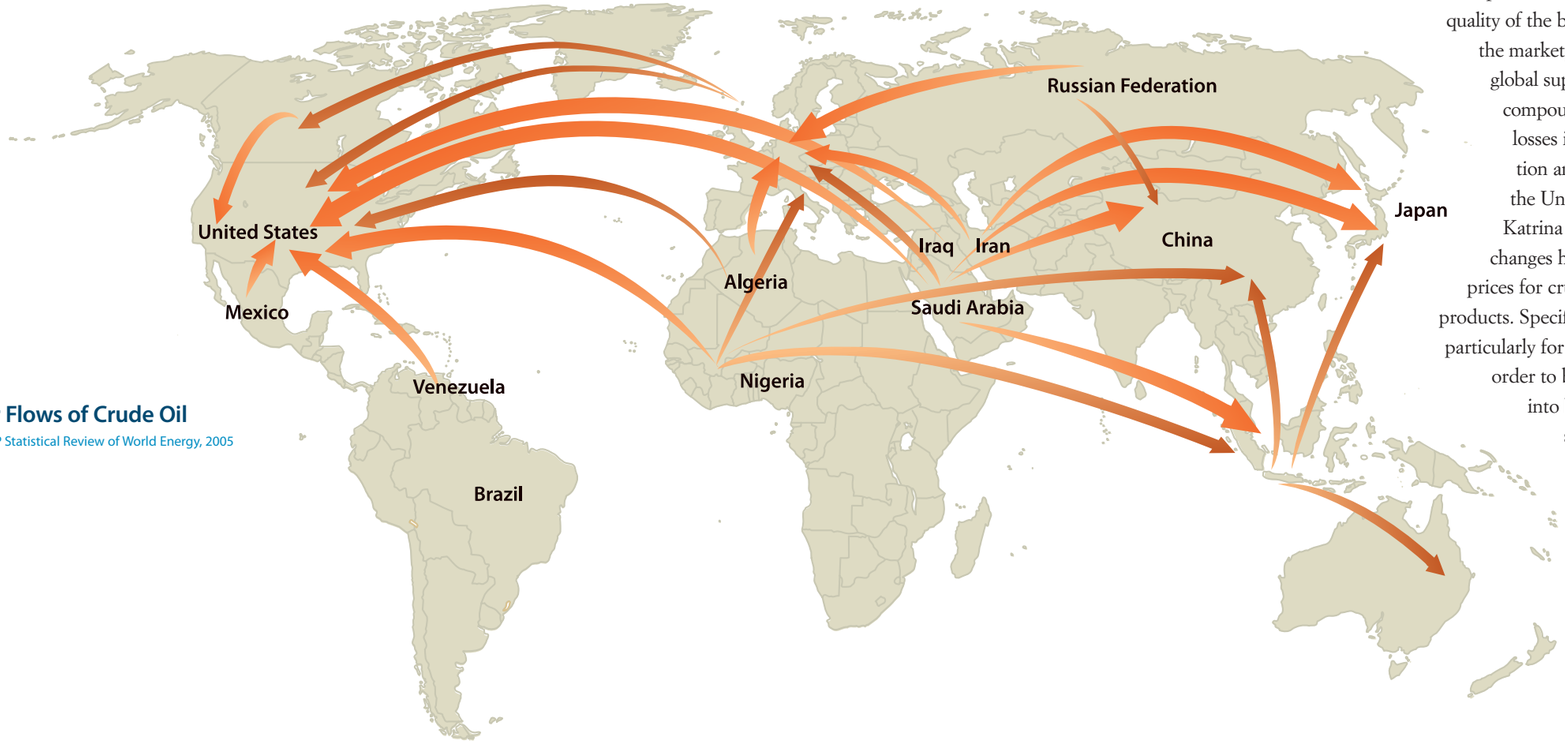
To properly address these questions, we need to understand three important points:

- First, crude oil and petroleum products are *global* commodities and, as such, their prices are determined by supply and demand factors on a *worldwide* basis (Figure 1).

- Second, the price of crude oil is the most significant factor determining the price paid for petroleum products. Consequently, the price of gasoline is largely determined by the worldwide demand for and supply of crude oil.

- Third, prices reflect the interactions of thousands of buyers and sellers, each bringing forth their respective knowledge and expectations of the demand for and supply of crude oil and petroleum products. These interactions occur in the physical as well as futures markets, with the attendant prices reflecting both current and future expected supply and demand conditions.

So how do these points relate to the current prices for gasoline, heating oil, and other petroleum products? These products represent a critical source of fuel for the world's economy, which recently sustained a period of stronger-than-expected growth. This economic growth gave rise to stronger-than-anticipated global demand for these fuels, which reduced available excess production capacity as well as the quality of the barrels of crude available to the marketplace. These changes in global supply and demand were compounded by the unexpected losses in both crude oil production and refining capacity in the United States from hurricanes Katrina and Rita in 2005. These changes have been reflected in prices for crude oil and petroleum products. Specifically, oil prices have risen, particularly for better quality crude oils, in order to bring supply and demand into balance. The impact of the strength of global economic growth was felt across many commodities, such as the steel, aluminum, concrete, and shipping industries.



1
Major Flows of Crude Oil
Source: BP Statistical Review of World Energy, 2005

Oil
Refined products power the world.

Oil is the world economy's most important source of energy and is, therefore, critical to economic growth. Its value is driven by demand for petroleum products, particularly in the transportation sector.

Petroleum products power virtually all motor vehicles, aircraft, marine vessels, and trains around the globe. In total, products derived from oil, such as motor gasoline, jet fuel, diesel fuel, and heating oil, supply nearly 40 percent of the energy consumed by households, businesses, and manufacturers worldwide.[1] Natural gas and coal, by comparison, each supply less than 25 percent of the world's energy needs.[2]

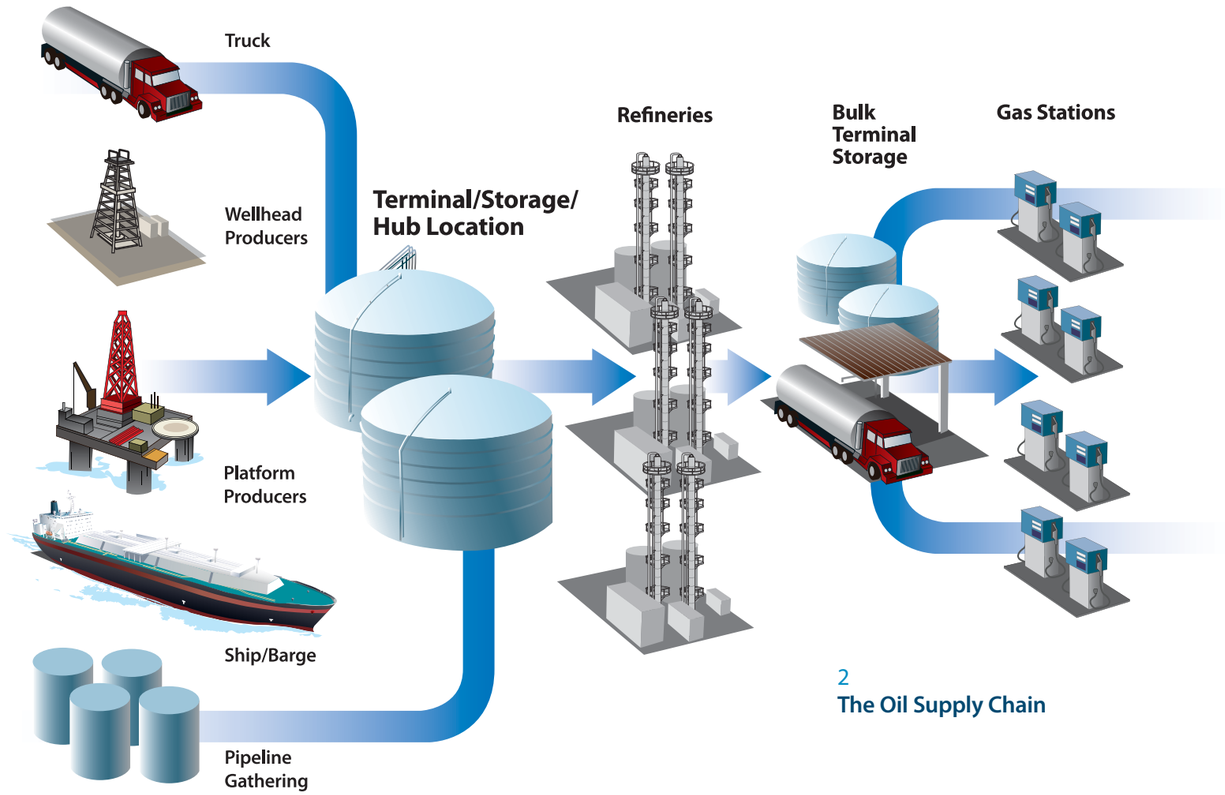
The principal activities, as illustrated in Figure 2, involved in moving crude oil from its source to the ultimate consumer are:

- Production, which involves finding, extracting, and transporting crude oil;
- Refining, the process by which crude oil is turned into products such as gasoline; and
- Distribution and marketing, which focus on moving those products to final consumers.

These activities occur within a global marketplace – an extensive physical infrastructure that connects buyers and sellers worldwide, all supported by an international financial market. The physical infrastructure encompasses a vast array of capital, including drilling rigs, pipelines, ports, tankers, barges, trucks, crude oil storage facilities, refineries, product terminals – right down to retail storage tanks and gasoline pumps.

1 U.S. Energy Information Administration, International Energy Outlook 2005, Table A2.

2 U.S. Energy Information Administration, International Energy Outlook 2005, Table A2.



2
The Oil Supply Chain

It links an international network of thousands of producers, refiners, marketers, brokers, traders, and consumers buying and selling physical volumes of crude oil and petroleum products throughout this chain of production. The international market also includes futures and other financial contracts that allow buyers and sellers to efficiently insure themselves against significant price and other business risks, thereby minimizing the impact of price volatility on their operations. In sum, the global oil market comprises thousands of participants who help facilitate the movement of oil from where it is produced, to where it is refined into products, to where those products are ultimately sold to consumers.

The following sections discuss the role of each of these different activities, focusing on how they have both affected and been affected by recent increases in oil and petroleum product prices. This includes the physical segments of the industry, i.e., production, refining, and distribution, as well as the financial sector, where the knowledge and expectations of thousands of buyers and sellers interact and where prices for current and future delivery of oil are ultimately formed.

The world consumes more than 85 million barrels of oil per day.[3] This supply comes from oil fields (or reserves) located around the world (Figure 3), produced by thousands of companies.

Supply

The world wants more.

The largest sources of supply are Saudi Arabia, Russia, the United States, Iran, Mexico, China, and Europe's North Sea. Within the United States, the largest areas of production are the Gulf Coast – including the Gulf of Mexico, West Texas, California, and Alaska.

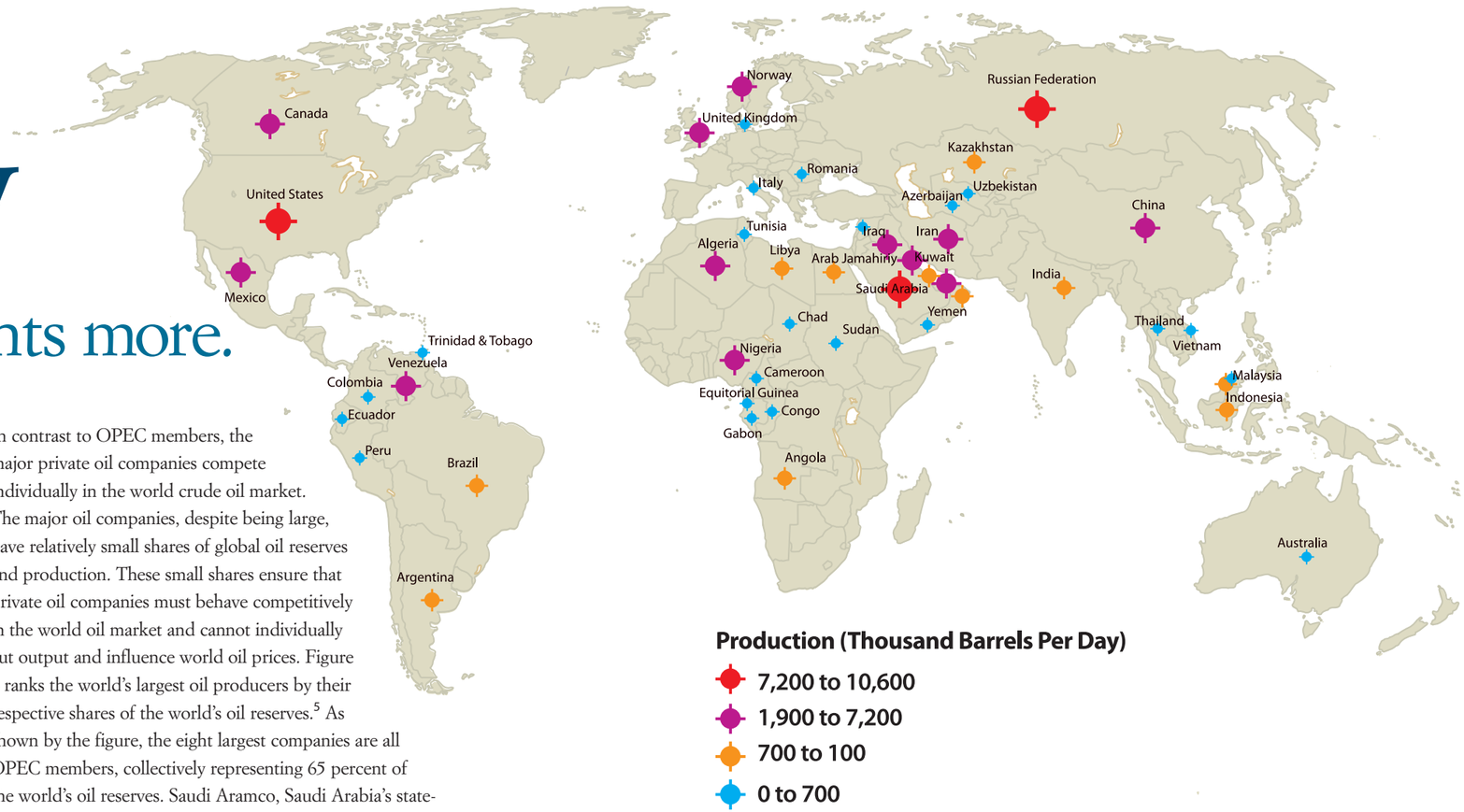
The Organization of Petroleum Exporting Countries (OPEC), an international cartel of oil-producing countries, is the single most important production-related entity. It produces about 40 percent of the world's daily consumption of crude oil.[4] OPEC's objective has been to manage its members' collective supply through individual producer quotas in order to influence world oil prices. While OPEC has sought to limit supply to the marketplace, its policies have also recognized that it is not in the organization's interest for crude prices to rise above levels that would harm global economic growth. Moreover, despite its large share of reserves and global production, OPEC's ability to influence crude oil prices has varied over time, as evidenced by the significant changes in world prices for crude oil over the last 25 years. These price changes highlight the fact that global supply-and-demand forces in the global oil market can limit OPEC's effectiveness in influencing world prices.

In contrast to OPEC members, the major private oil companies compete individually in the world crude oil market. The major oil companies, despite being large, have relatively small shares of global oil reserves and production. These small shares ensure that private oil companies must behave competitively in the world oil market and cannot individually cut output and influence world oil prices. Figure 4 ranks the world's largest oil producers by their respective shares of the world's oil reserves.[5] As shown by the figure, the eight largest companies are all OPEC members, collectively representing 65 percent of the world's oil reserves. Saudi Aramco, Saudi Arabia's state-owned production company, alone owns over 21 percent of the world's oil reserves. In contrast, none of the multinational companies has more than 1.1 percent of world's oil reserves. These small percentages speak directly to the inability of the major oil companies to influence the world price of crude oil.

3 One barrel equals 42 U.S. gallons. U.S. Energy Information Administration, Short-term Energy Outlook, April 2006, Table 3.

4 U.S. Energy Information Administration, Short-Term Energy Outlook, February 2006, Table 3.

5 Energy Intelligence Group, Inc., accessed at http://energyintel.com/print_me.asp?document_id=137158&pID=18, March 2006; BP Statistical Review of World Energy 2005, June 2005.



3
Global Oil Production
Source: BP Statistical Review of World Energy, 2005

Global Trading Patterns

Existing global trading patterns, as illustrated by Figure 1, primarily reflect the result of buyers and sellers responding to market forces to get each type of crude oil from where it is produced to where it is most valued, accounting for the cost of transportation. That is, trade flows at any point in time are largely a result of the relative advantages in transportation costs and buyers' preferences for different qualities of crude oils.

However, because buyers and sellers can and do substitute one type of oil for another, specific trading patterns are not crucial to evaluating supply and demand or pricing. For example, if the supply of crude oil from a source were cut off – regardless of whether that oil flowed to the United States – competition from buyers for the world's remaining supplies would drive up all oil prices. Alternatively, if a country decided to cut off shipments of oil to the United States but maintained its production, there would be relatively little long-term impact on price. (This is, of course, holding aside any price changes due to an increase in geopolitical risk or smaller influences, such as shifting transportation and refining patterns.)

Those supplies previously flowing to the United States would find new buyers who, in turn, would release their existing purchases to the market. U.S. buyers would then seek those newly released supplies. In sum, what is of most concern is the global supply and demand for crude oil. In the longer term, trade flows are of significantly less important.

These facts have direct implications for the United States, which stands as the international crude oil market's largest consuming nation. As shown by Figure 5, the United States consumes approximately one-quarter of the world's daily supply of crude oil. In order to meet the nation's demand for petroleum products, U.S. refiners must import about ten million barrels of crude oil per day,[6] representing nearly two-thirds of their refinery throughput. These imports come from scores of different countries,[7] including, for example, Canada, Mexico, Saudi Arabia, Venezuela, and Nigeria, which in 2005 represented the top five sources of foreign supply.[8] This pattern of trade demonstrates the degree to which the United States is interconnected to the world oil market.

The Cost of Crude and Prices at the Pump

How does the world crude oil market affect the pump price of gasoline? The price of crude oil is the most significant factor determining the price of gasoline (Figure 6) because it represents the largest component of the underlying cost of producing and marketing gasoline. Figure 7 shows the relationship between the price of gasoline and the price of crude over the last 20 years. Together, Figures 6 and 7 underscore the following point: The change in the price of gasoline is closely related to a change in the price of crude oil. This was noted by a Federal Trade Commission report that found that over the past 20 years 85 percent of the movement in U.S. gasoline prices has been explained by changes in crude prices.[9]

6 U.S. Energy Information Administration, U.S. Weekly Imports & Exports, accessed at http://tonto.eia.doe.gov/dnav/pet/pet_move_wkly_dc_NUS_200_mbbldpd_w.htm, March 1, 2006.

7 U.S. Energy Information Administration, U.S. Imports by Country of Origin.

8 U.S. Energy Information Administration, Crude Oil and Total Petroleum Imports: Top 15 Countries.

9 Federal Trade Commission, The Dynamic of Supply, Demand, and Competition, June 2005.

4

World's Largest Oil Companies Based on Liquid Reserves in 2003

Note: Figures account for recent Unocal /ChevronTexaco and Burlington/ConocoPhillips mergers

Source: Energy Intelligence Group, Inc. and BP Statistical Review of World Energy, June 2005

Rank	Company	Country	Liquids Reserves (Millions of Barrels)	Percent of World Reserves
1	Saudi Aramco	Saudi Arabia	259,400	21.83%
2	NIOC	Iran	125,800	10.59%
3	INOC	Iraq	115,000	9.68%
4	KPC	Kuwait	99,000	8.33%
5	PDV	Venezuela	77,800	6.55%
6	Adnoc	UAE	55,210	4.65%
7	Libya NOC	Libya	22,680	1.91%
8	NNPC	Nigeria	21,153	1.78%
9	Pemex	Mexico	16,041	1.35%
10	Lukoil	Russia	15,977	1.34%
11	Gazprom	Russia	13,561	1.14%
12	Exxon Mobil	United States	12,856	1.08%
13	Yukos	Russia	11,833	1.00%
14	PetroChina	China	10,997	0.93%
15	Qatar Petroleum	Qatar	10,950	0.92%
16	Sonatrach	Algeria	10,533	0.89%
17	BP	United Kingdom	10,081	0.85%
18	Petrobras	Brazil	9,772	0.82%
19	ChevronTexaco/Unocal	U.S.	9,274	0.78%
20	Total	France	7,323	0.62%
21	Royal Dutch/Shell	UK & Netherlands	7,257	0.61%
22	Petronas	Malaysia	7,136	0.60%
23	Surgutneftgas	Russia	6,771	0.57%
24	ConocoPhillips/Burlington	United States	5,784	0.49%
25	Pertamina	Indonesia	4,722	0.40%
26	Sibneft	Russia	4,623	0.39%
27	Eni	Italy	4,138	0.35%
28	ONGC	India	3,711	0.31%
29	Sinopec	China	3,257	0.27%
30	PDO	Oman	3,193	0.27%
31	Socar	Azerbaijan	3,105	0.26%
32	Rosneft	Russia	2,400	0.20%
33	TNK-BP	Russia/UK	2,150	0.18%
34	Occidental	United States	2,038	0.17%
35	Syrian Petroleum	Syria	1,886	0.16%
36	Repsol YPF	Spain	1,882	0.16%
37	EGPC	Egypt	1,800	0.15%
38	Statoil	Norway	1,789	0.15%
39	Ecopetrol	Colombia	1,542	0.13%
40	Amerada Hess	United States	1,226	0.10%
41	Norsk Hydro	Norway	993	0.08%
42	EnCana	Canada	957	0.08%
43	Devon Energy	United States	870	0.07%
44	Apache	United States	844	0.07%
45	Petro-Canada	Canada	768	0.06%
46	Anadarko	United States	646	0.05%
47	BG	United Kingdom	645	0.05%
48	Marathon	United States	578	0.05%
		World	1,188,300	100.00%

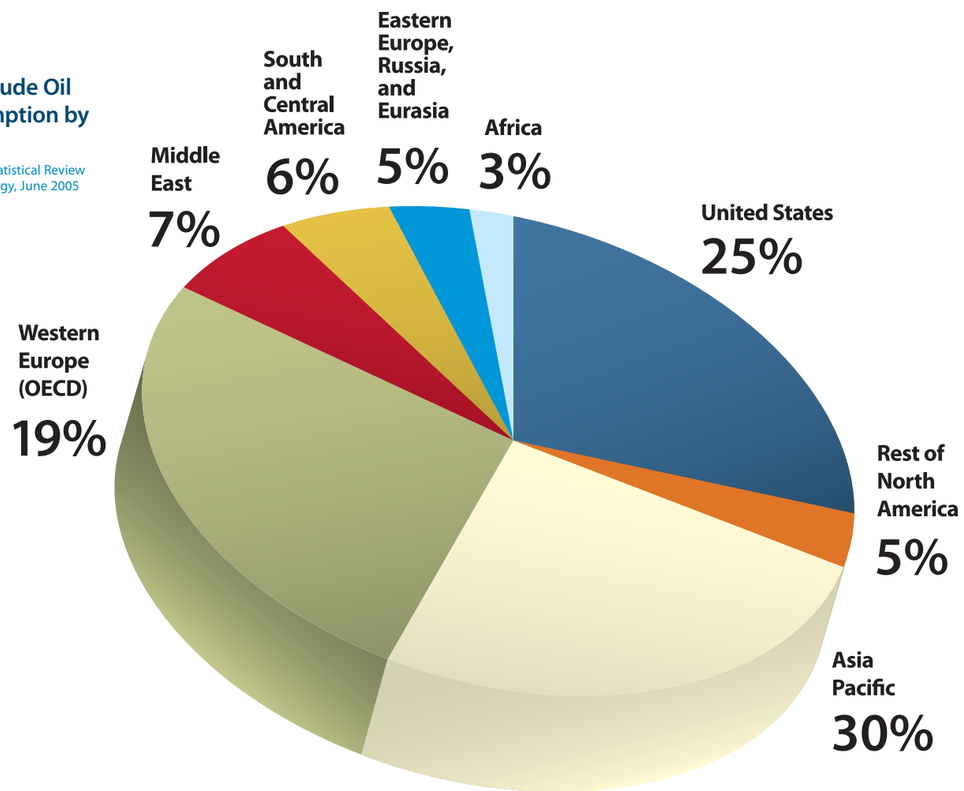
Why the Sustained Rise in Oil Prices Over the Past Few Years?

The price of crude oil increased because worldwide demand has increased in response to global economic growth – and supply has not fully kept pace. This growth has included both developed countries, such as the United States, and emerging countries, such as China.[10] Figure 8 shows the rapid increase in global demand, particularly since 2003. It highlights the impact of the largely unanticipated growth in the Chinese economy on worldwide demand for petroleum products.

A substantial portion of this increase in demand appears to have been met by the world's existing unused production capacity. Because of the time it takes to bring significant new production on to the market, the rise in global demand resulted in a reduction of the world's spare capacity. This is illustrated by Figure 9, which shows the significant reduction in the world's spare production capacity from roughly 5.6 million barrels per day in 2002 to less than 2 million barrels per day in 2003 and thereafter. This reduction corresponds closely to the largely unforeseen spike in global demand over this same time period.

10 For changes in individual countries' consumption of crude oil, see, for example, the BP Statistical Review of World Energy 2005, June 2005.

5
2004 Crude Oil Consumption by Region
Source: BP Statistical Review of World Energy, June 2005



These changes in the consumption and consequent reduction in spare capacity have been compounded by the rise in political and, hence, supply uncertainty confronting the world oil market. Examples of the uncertainty due to geopolitical events include the loss of supplies as a consequence of the war in Iraq, civil unrest in Nigeria and Venezuela, as well as ongoing uncertainty concerning the availability of exports from Iran.

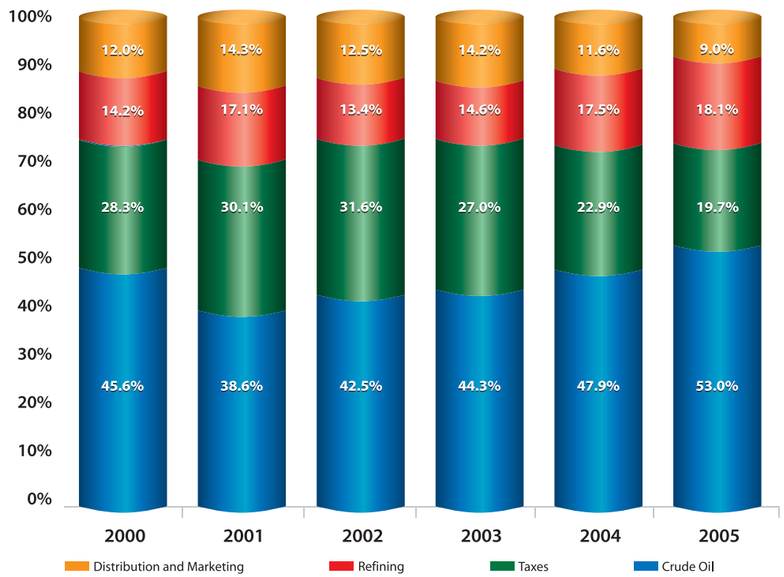
This uncertainty of supply impacts prices in the following manner: In periods of relatively little excess production capacity, there exists less ability on the part of the market to absorb the loss of supply because disruption results in a shortage that cannot be made up by other sources. Buyers are, therefore, more willing to bid up prices to shore up existing supplies.

It is also uncertain that there will be a return to the historical levels of excess capacity that characterized world oil markets prior to 2003.

Finally, prices not only reflect the overall supply and demand of crude but also the quality of the crude oil. Not surprisingly, desirable crude oils are produced first because, as discussed in greater detail below, they can be sold for more than the less-desirable crude oils. Thus, the excess production capacity that remains is largely for heavier, less desirable crude oils. These are less capable of producing the products consumers want and are less well-matched to available refining capacity than lighter, sweeter crude oils.

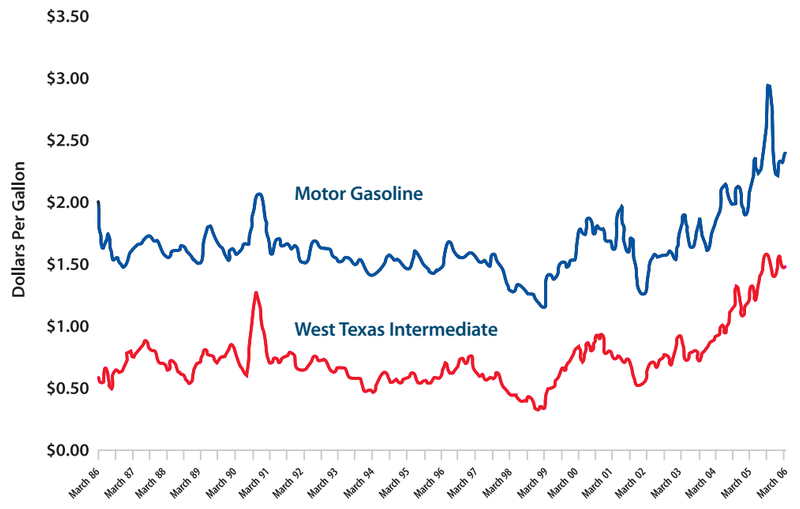
As a result of the aforementioned factors, the world crude oil market is very tight and prices reflect that tightness. Stated alternatively, the price of oil has risen in order to balance available supplies with existing demand. This is particularly the case for the prices of lighter, sweeter crude oils, which are the prices that are typically reported in the press. And because the prices of petroleum products closely track the price of crude oil, the prices of products like gasoline and heating oil have also risen significantly over the last few years as the underlying prices for crude oil have increased.

6
Components of Retail Gasoline Prices
Source: Energy Information Administration

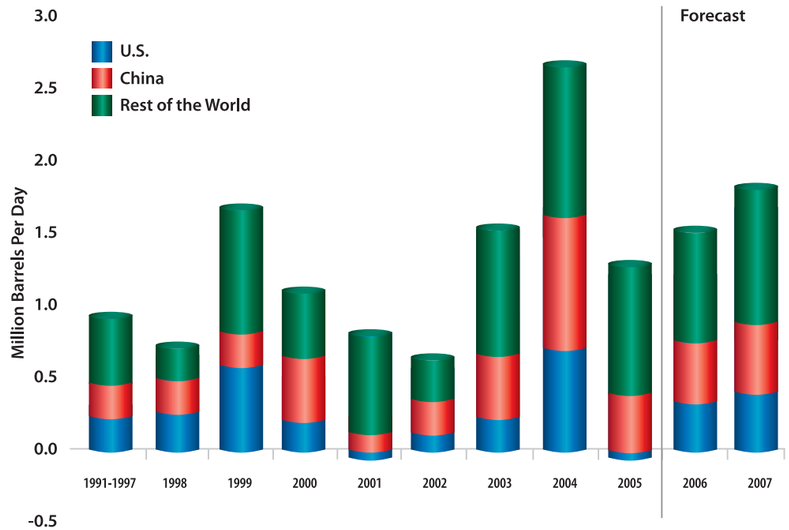


7
Inflation-Adjusted Price of West Texas Intermediate Crude Oil and Unleaded Gasoline
Note: Inflation-Adjusted January 2006 Dollars

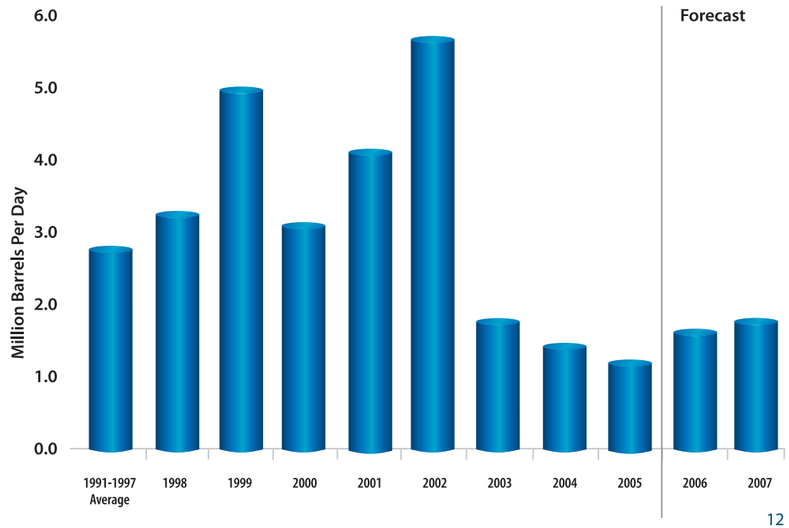
Source: Energy Information Agency and Bureau of Labor Statistics



8
Year-to-Year Change in World Demand for Oil
Source: Energy Information Administration



9
World Spare Oil Production Capacity
Source: Energy Information Administration



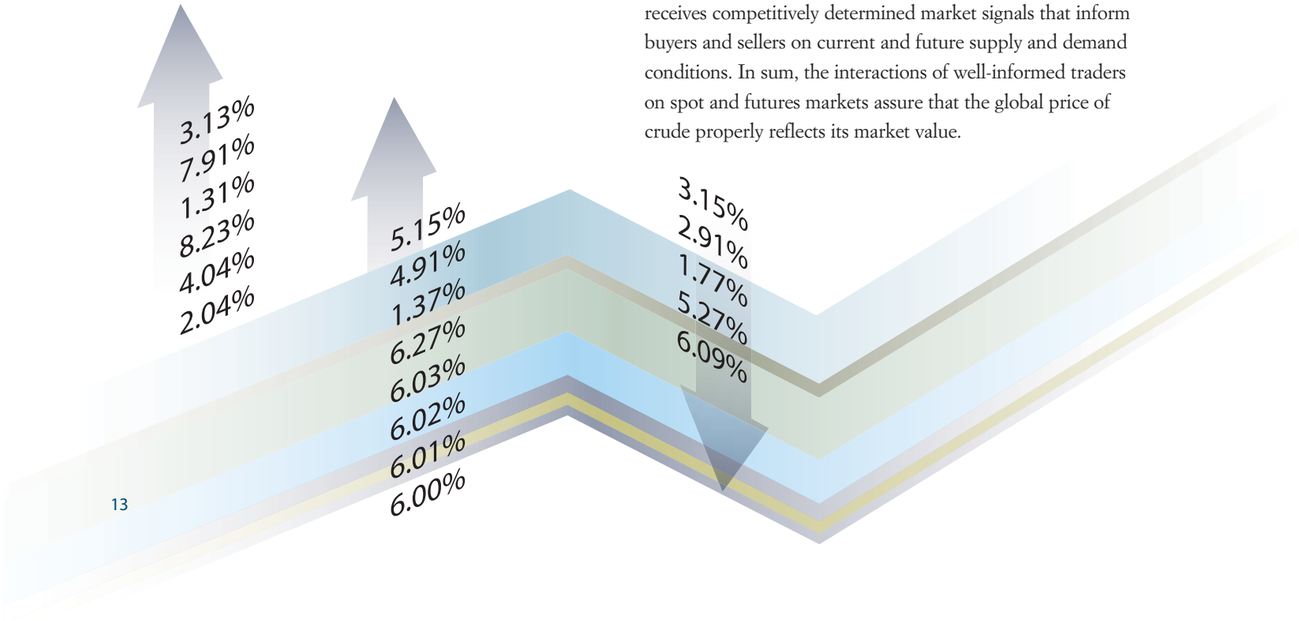
Over the last 25 years, the global oil industry has seen a transformation in the contractual structures used to purchase and sell crude oil.

Changes

Market structures are transforming.

A market structure formerly based on rigid long-term, commercial arrangements has been replaced by a more efficient one that allows buyers and sellers greater flexibility in establishing commercial relationships that better meet their respective needs.

Whereas "spot" and "futures" markets have been long-established institutional structures for many commodities, they are relatively new to the oil industry. Their uses, however, have grown rapidly and are now a well-developed part of the market. Today it is from the spot and futures markets that the global oil market – producers, refiners, marketers, traders, consumers, investment banks, hedge funds, and so forth – receives competitively determined market signals that inform buyers and sellers on current and future supply and demand conditions. In sum, the interactions of well-informed traders on spot and futures markets assure that the global price of crude properly reflects its market value.



Spot Markets versus Futures Transactions

The term "spot markets" is used to describe transactions which involve the near-term purchase and sale of a commodity, such as crude oil and refined products. In the crude oil market, "spot" contracts typically involve delivery of crude over the coming month, e.g., a contract signed in June for delivery in July. Spot markets are often referred to as the "physical market" since they entail the buying and selling of physical volumes. These markets consist of many buyers and sellers, including refiners, traders, producers, and transporters, transacting throughout the chain of supply – from the oil well right through to the refinery. These markets provide the benefit of allowing buyers and sellers, e.g., refiners and marketers, to more easily adjust their crude supplies to reflect near-term supply and demand conditions in both the product markets and the crude oil markets.

A futures contract, in contrast to a spot transaction, concerns the future purchase or sale of crude oil or petroleum products.* Specifically, it is a contract that carries the obligation for delivery of a given quantity of crude in the future. The contract specifies the volume, type or grade of crude oil, the price, the future time in which the crude is bought or sold, and the particular location to which it is to be delivered. The buying and selling of futures contracts occurs on organized exchanges. Since the vast majority of traders "close out" their positions (i.e., cancel out a contract prior to the time it would require the trader to actually deliver or take delivery of the crude oil), futures transactions rarely entail the actual delivery. As a result, the futures market is often referred to as the "financial market."

* There are many other types of contractual structures and financial instruments used by the oil industry, as well. These include forwards (an agreement today to sell at an agreed-upon future date), swaps (an agreement to trade or "swap" commodities of different qualities or at different locations or at different times), options (an agreement that provides the right, i.e., the "option," to buy or sell a commodity), and swaptions (an agreement combining a swap and an option). Prices of futures contracts are the most commonly reported by the trade press and most watched by the public.

The crudes underlying futures contracts are often called "marker" or "benchmark" crudes. A common example of a marker crude is West Texas Intermediate, which is the principal crude underlying the futures contract traded on the New York Mercantile Exchange, or NYMEX. These organized exchanges allow for the competitive interaction of thousands of independent traders, including both commercial as well as financial institutions. These interactions, in turn, give rise to publicly reported futures prices that reflect the market's best estimate today of what future supply and demand conditions and, hence, prices will be.

Prices of futures contracts are connected to prices in the physical market because futures positions that are not closed out will lead to either delivery or receipt. Thus, the closing "futures" price for any given month must equal the "physical" price at the time trading in the futures contract ends. With delivery, the futures price effectively becomes a physical price at the time the futures contract matures. So, for example, the closing "futures" price for delivery in June must equal the "spot" price for oil in June. If the prices differed, a trader would buy in the market in which the price is lower and immediately sell it into the market where the price is higher and earn a profit. No one wants to leave such profit opportunities on the table.

The prices in the spot market transactions described above are often tied to prices for crude oil on organized exchanges (e.g., NYMEX) with, for example, price adjustments to account for differences in the quality of the crude oil being traded and the location of the spot market transaction. In fact, even OPEC countries often base their prices on the prices determined on organized exchanges, with appropriate quality and other differentials. The benefit of these arrangements is that the price of the physical crude oil will be set at the market level at the time of delivery. This protects buyers from dramatic price fluctuations that could occur while crude oil was in transit to its final markets.

Benefits of Futures Markets

Futures markets bring a number of benefits to the global oil market. First, crude oil futures markets provide information about future expectations regarding supply and demand conditions. Second, these expectations are made transparent, i.e., known to the market, in the form of a series of futures prices for crude to be delivered at different dates in the future. Finally, crude oil producers, marketers, refiners, and others are able to use the financial contracts on the exchanges to manage risk, facilitated, in part, by the increasing participation of the number of investors without a commercial interest in the petroleum industry (i.e., no capacity to produce, refine, store, or sell physical volumes of crude or petroleum products).

As described above, futures markets bring together valuable information about the market's expectations about *future* supply and demand conditions in the physical market – conditions that will ultimately determine the price for oil. If, for example, the price today of an oil futures contract for the delivery of oil three months from now is $65 per barrel, that "futures" price represents thousands of buyers' and sellers' best estimate of what the price of oil will be for physical delivery three months hence. And, if in this hypothetical situation, the current (spot) price were $60 per barrel, the futures market would then be revealing the fact that it is the market's current expectation that prices are expected to increase over the near future. That is, based on the information of thousands of commercial participants and sophisticated financial institutions, futures prices are telling producers and consumers alike that the crude oil market is likely to remain tight for the foreseeable future.

Of course, actual prices for crude in the future may be different than those implied by today's future prices. Because it is the market's best estimation today that oil will be $65 per barrel in three months does not necessarily imply that oil will, in three months, be $65 per barrel. As expectations about future supply and demand conditions change, e.g., due to colder than expected weather or unforeseen political events that could cause temporary supply disruptions, so too will current and future expected prices.

This trading process, i.e., the competition between various market players in the futures markets, is beneficial because it provides transparent price information to those who can respond to this information by, for example, putting additional oil in storage or taking steps to reduce their consumption in the future. To illustrate, when prices of futures contracts with early delivery dates exceed those with later delivery dates, the market consensus is for prices to fall in the future.** This provides an economic incentive to draw down inventory today – thereby softening prices today. On the other hand, when prices of futures contracts with early delivery dates are lower than those with later delivery dates, the market consensus is for prices to rise in the future.◆ This provides the economic incentive to build inventories if the higher futures prices will cover the cost of storage. This saves supply for the future when prices say it is most needed. In short, futures market prices provide information about expected future supply and demand conditions that producers and consumers can act on today. The effect of these actions is to shift the supply of crude oil from periods of relatively lower prices to periods where crude oil prices are expected to be higher. These actions, in turn, tend to ameliorate price swings.

** The futures market is commonly said to be "backwardated" under these conditions.

◆ The futures market, under these conditions, is commonly termed "in contango."

Finally, futures markets permit industry participants to manage the significant risks they bear in the production, refining, and transacting in crude oil and petroleum products.❖ They do so by making it possible, for example, for an oil producer to lock in prices for its future production on the futures market or to use other instruments to limit the price fluctuations it will realize. The fact that these financial markets are highly liquid, with thousands of traders, allows users to shed risk at the least possible cost and at prices that reflect all of the information brought to the market by those trading. Consumers benefit because holding down producers' risks encourages investment in future supplies.

❖ These risks include market risk, i.e., risk due to the change in oil prices; credit default risk, i.e., the counter-party may fail to meet the financial terms of the contract; liquidity risk; i.e., risk arising from the inability to sell an asset; basis risk, i.e., prices for the types of crudes or products owned by the participant do not perfectly track changes in the benchmark product; operational risk; and political risk, e.g., expropriation.

Crude oil needs to be refined in order to produce the gasoline and other products demanded by consumers. Refining a barrel of crude oil involves a series of complex processes.

The first stage for all refineries focuses on the initial distillation in which the barrel of crude oil is heated and broken down into its component parts. Subsequent processes, often referred to as "conversion," focus on transforming lower-valued products into higher-valued products by either removing impurities, such as sulfur, or further transforming lower-valued products, such as bunker fuel suited for ships, into higher-valued products, such as gasoline for automobiles. It is the size and scope of these various "conversion" processes that typically distinguish differences in refineries. As a result, different refineries will prefer different types of crude oil.

Complexity

Meeting consumer demand isn't easy.

U.S. refining capacity stands at approximately 17 million barrels per day. At the beginning of 2005, this capacity was spread across 55 refinery companies operating 144 refineries.[11] These companies include vertically integrated operations (i.e., companies involved in the production of crude oil), as well as independent refiners (i.e., those with little or no crude production capabilities). Operations, reflecting both the economics of the industry as well as each company's particular business strategy, range in scale from millions of barrels per day down to thousands of barrels per day. No refiner, however, owns more than 13 percent of total U.S. refining capacity.[12]

The current composition of the U.S. refining sector highlights the considerable transformation realized by this segment of the industry. These changes have been driven in large part by the long-term decline in economic returns realized by the U.S. domestic refining sector. Figure 10 illustrates this decline through gross refining margins, a common proxy for trends in profitability. As shown by the figure, the trend in profitability has, until the past few years, been consistently moving downward.

As a consequence, the U.S. market has seen a decline in the ownership of refining capacity on the part of major U.S. oil companies. During the 1990s, the major U.S. oil companies reduced their ownership of refinery capacity from 72 percent to 60 percent of total U.S. capacity, while the "fast-growing independent refiners" increased their refinery capacity from 8 percent to 23 percent of total U.S. capacity.[13] The largest independent refiners now rival major oil companies in their capabilities to meet the nation's growing needs for cleaner transportation fuels. In addition, competition from imports is increasing, as more than 10 percent of U.S. daily consumption of petroleum products now comes from outside the United States.[14] These changes, taken together, reflect the competition faced by domestic refiners in their efforts to meet U.S. demand for petroleum products.

11 U.S. Energy Information Administration, Petroleum Supply Annual 2004, Vol. I, Tables 36 and 40.

12 U.S. Energy Information Administration, Petroleum Supply Annual 2004, Vol. I, Tables 36 and 40.

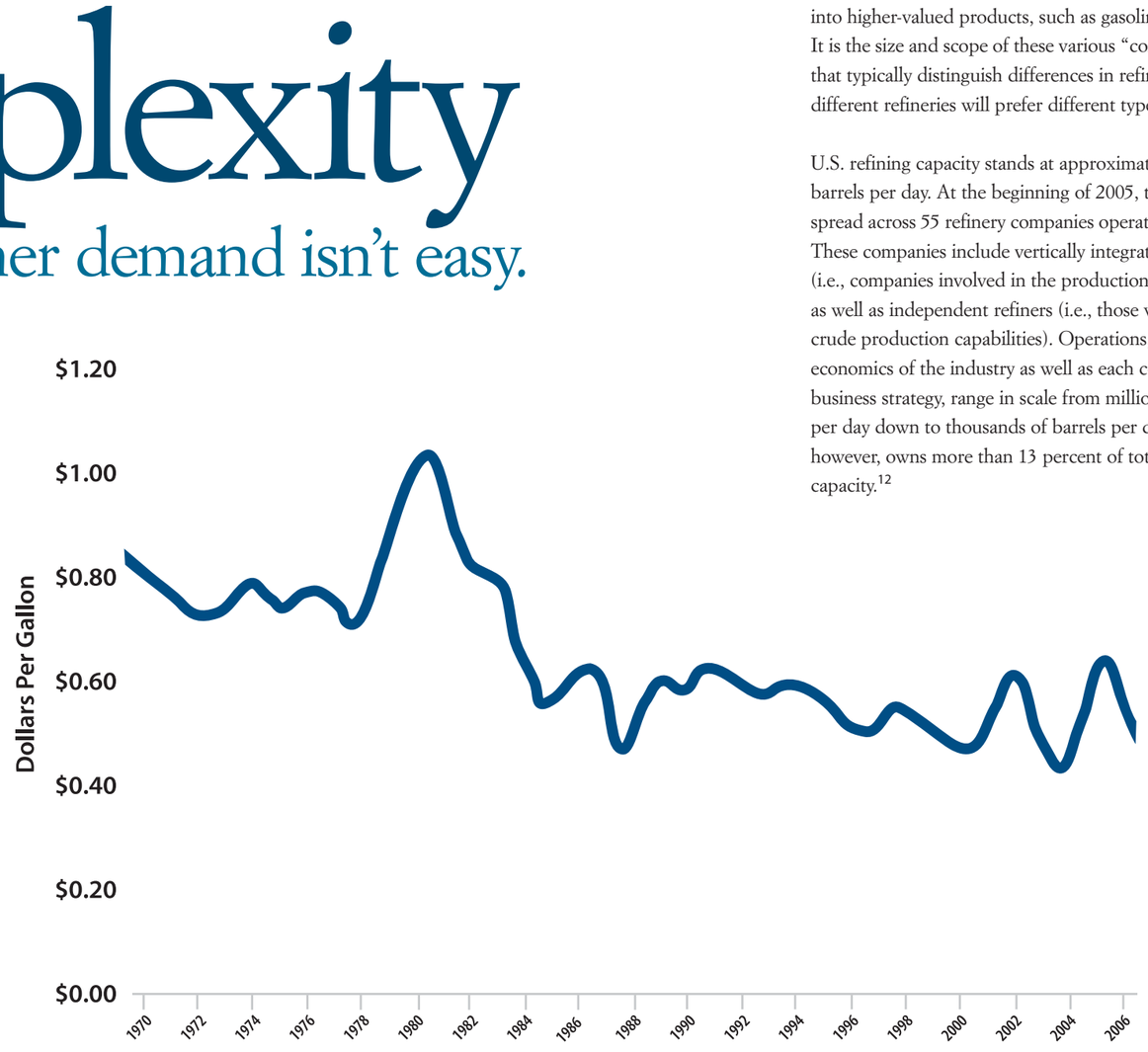
13 U.S. Energy Information Administration, The U.S. Petroleum Refining and Gasoline Marketing Industry, July 1999.

14 U.S. Energy Information Administration, Petroleum Supply Monthly, February 2006, Table 4.

Inflation-Adjusted Gross Margin in Refining, Distribution, and Marketing of Gasoline

Note: Inflation-Adjusted 2005 Dollars

Source: Energy Information Administration, Bureau of Labor Statistics and API



How Has the Refining Sector Been Affected by Today's Crude Market?

The growth in demand for petroleum products has affected the refining sector and this, in turn, has significantly affected the global crude oil market. As expected, the utilization rate of the world's refineries increased significantly during the 2000-2004 period.[15] In the United States, utilization rates exceeded 90 percent even as the capacity to refine crude continued to expand over the period.[16] Once the required downtime to perform routine maintenance is taken into account, refinery utilization rates are extremely high. Moreover, as the demand for petroleum products increased, so too did the demand for conversion capacity noted above, i.e., capacity capable of producing relatively more valuable products from heavier crude oils. These changes reflected not only the increasing demand for higher-value products, such as gasoline and diesel fuel, but ongoing changes in fuel specifications, as well, which increase demand for such conversion capacity.

The reduction in spare refining capacity, in turn, has affected the international crude oil market. As noted above, there are many different types of crude oil, e.g., West Texas Intermediate, West Texas Sour, Arab Heavy, Bonny Light, to name just a few. While there are many characteristics to any given crude, the two most common distinctions relate to its viscosity, i.e., how "light" or "heavy" a crude is, and the amount of impurities contained within the oil, of which sulfur is the most commonly identified. These characteristics indicate the amount of processing required to convert the crude oil into saleable petroleum products.

Generally speaking, lighter crudes require less processing to produce a relatively more valuable slate of petroleum products, such as gasoline, diesel, and jet fuel, than heavier crudes. The more sulfur contained in a crude oil, the more "sour" it is said to be and the more processing required before resulting petroleum products can be sold into the marketplace. Thus, "sour" crudes require more processing than "sweet" crudes. As spare refining capacity has diminished, particularly the capacity to turn heavy, more sour crude oil into high-valued products, the refining sector has placed a relatively higher value on lighter, sweeter ("light sweet") crudes than on heavier, more sour ("heavy sour") crudes. This is because light sweet crudes require less processing to produce a given volume of higher-valued products.

Refining margins currently reflect these changes. Holding aside any temporary impacts resulting from Hurricanes Katrina and Rita, those refiners that can produce more valuable products from the heavier, more sour crudes have tended to earn higher margins relative to those refiners who have not yet invested in this equipment. Of course, the former refiners typically have faced higher costs due to the additional equipment required to process heavy, sour crudes, but these costs have tended to be outweighed by the relative differences in prices of heavy sour and light sweet crudes. This outcome can be properly interpreted as the market providing an economic incentive for additional investment to process those heavier, more sour crudes.

15 BP Statistical Review of World Energy 2005, June 2005.

16 U.S. Energy Information Administration, U.S. Percent of Utilization of Refinery Operable Capacity, accessed at http://tonto.eia.doe.gov/dnav/pet/hist/mopueur2m.htm, February 23, 2006.

Refined Petroleum Product Markets

Conceptually, the market for refined petroleum products is very similar to the crude oil market in that there is widespread buying, selling, and trading of products in both the physical market (e.g., spot market) and the futures market. And just as with crude oil, there are significant international flows of refined products. The United States, for example, imports approximately 3.5 million and exports approximately one million barrels per day of refined products.[17]

Trade in petroleum products reflects the international market's efforts to match what is produced (supply) with what consumers prefer (demand). In the United States, for example, the majority of exports tend to involve products for which there is little or no domestic demand. This would include commodities produced as by-products of the refining process and that are no longer consumed domestically, such as petroleum coke; products for which there is little seasonal demand, such as heating oil sent to the Southern Hemisphere during our summer season; and products for which there is no domestic market due to environmental specifications, such as residual fuel and gasoline that fails regional fuel specifications. Imports, in contrast, reflect domestic demand for products such as gasoline and winter heating oil, i.e., products demanded by U.S. consumers that cannot otherwise be met by domestic refiners. In sum, these flows highlight the fact that the United States is in the position of having to compete on international markets to satisfy demand for those products most desired by U.S. consumers.

In addition, petroleum products and futures are also traded on organized exchanges, such as NYMEX and the Chicago Mercantile Exchange, just like crude oil. Thus, the interactions of traders on organized exchanges establish transparent prices for petroleum products, as well as crude oil. Petroleum product deliveries in particular areas will often be at prices based on those determined on an organized exchange, with adjustments for differences in location and the precise type of petroleum product being traded.

As noted above, crude oil is the single largest input cost associated with the manufacturing of petroleum products. Consequently, changes in crude oil prices have a significant effect on petroleum product prices and changes in expectations about future crude oil prices can lead to changes in both current and future prices of gasoline and other petroleum products through the building up or drawing down of inventory. However, prices for petroleum products can also change due to supply-and-demand factors unrelated to the crude market. Such factors would include, for example, an unexpected hurricane that interferes with refinery operations, or colder-than-normal weather in the Northern Hemisphere, or environmental mandates and regulatory requirements. These events can cause the price paid for product to be delivered today or months from now to rise or fall independent of crude oil price changes.

As with the crude oil market, there exists a dynamic relationship between current prices and prices for petroleum products to be delivered in the future. A change in the price of gasoline or heating oil to be delivered some months in the future can lead to a similar change in the futures price paid for product to be delivered next month. That, in turn, can have implications for prices of products throughout the chain of distribution. A change in "futures" prices, for example, can affect the prices being paid today on the spot market. As discussed above, these price changes provide market participants with signals about whether they should be building up or drawing down inventories, thereby affecting the supply of product currently on the market. Thus, the change in the spot price could, in turn, lead to a similar change in the wholesale or "rack" price paid for gasoline by retailers and, in turn, in the prices paid by motorists at the pump.

17 U.S. Energy Information Administration, Petroleum Supply Monthly, February 2006, Tables 36 and 48.

Distribution and marketing of petroleum products represent the third segment of the petroleum supply chain.

Movement

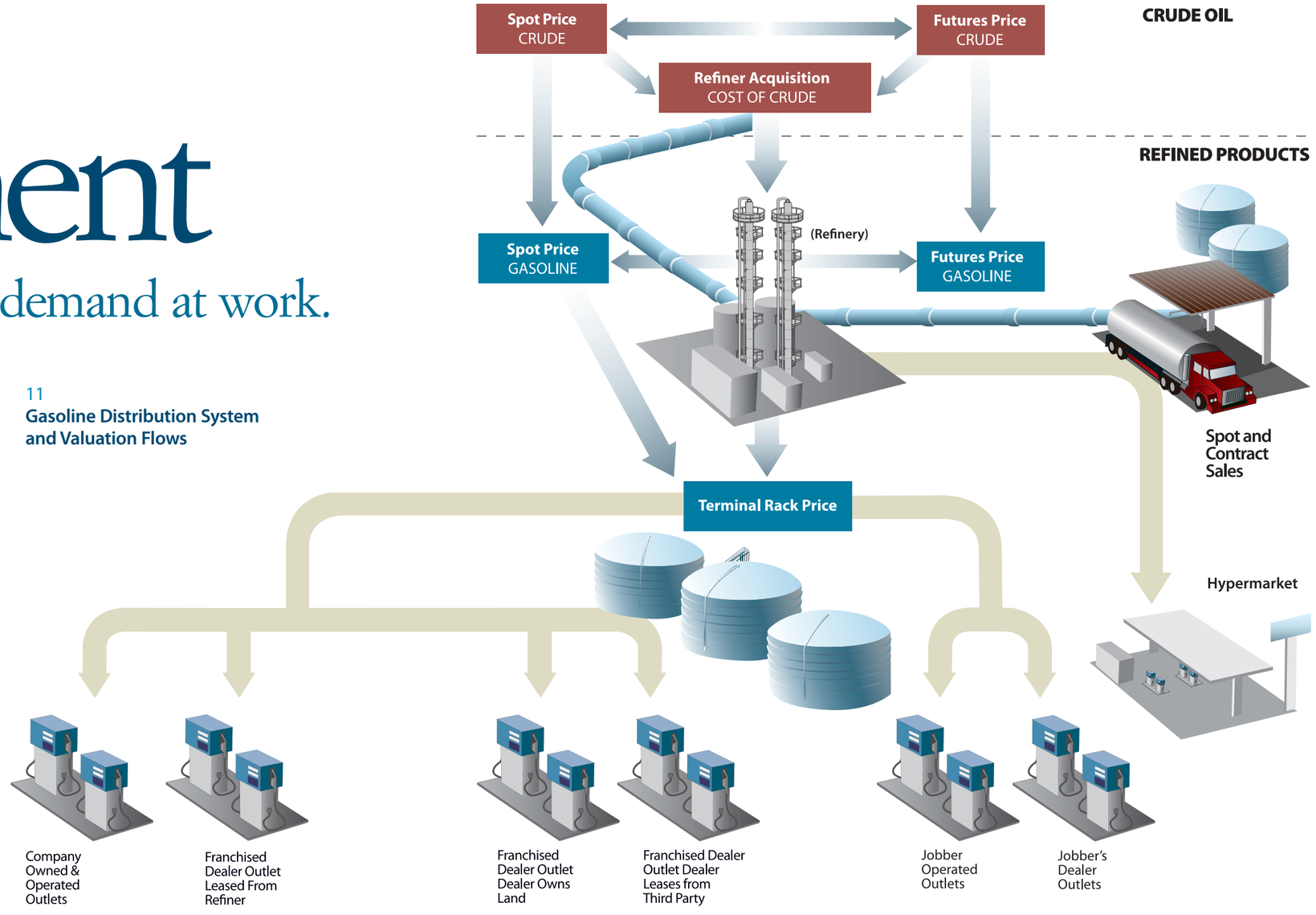
The forces of supply and demand at work.

They involve the movement of refined products – gasoline, diesel, heating oil, kerosene, and jet fuel – from the refinery to the end consumer (Figure 11).

Like crude oil, petroleum products are bought and sold throughout the chain of distribution.❑ Distribution and marketing, however, represent a relatively small share of the price paid by consumers. For example, the marketing and distribution of gasoline typically represent less than 15 percent of the pump price paid by the average motorist.

❑ The majority of finished product is transported from the refinery through pipelines to the product terminal. This is true of domestically produced crude oil, as well, as pipelines represent the most efficient method of moving large quantities of liquids. Pipeline rates are regulated by the Federal Energy Regulatory Commission (FERC).

11
Gasoline Distribution System and Valuation Flows



Gasoline, which represents nearly 45 percent of the domestic production of all refined products, is the petroleum product most demanded by U.S. consumers.[18] There are almost 169,000 retail gasoline outlets in the United States, selling 17 different formulations of gasoline designed to meet different air quality standards around the country. While, as discussed above, the cost of crude oil is the largest single component of the retail price of gasoline, gasoline prices ultimately are established by the forces of supply and demand, with retail prices reflecting local, state, and federal taxes and the value added to the distribution of gasoline as it moves from the refinery to the ultimate consumer. Of course, for any particular retailer, a number of factors go into determining the pump price, including the location of the station, delivery costs, the commercial arrangements with the station's supplier, whether the station sells branded or unbranded gasoline, the size of the station, and taxes – to name just a few.■

Competition in the retail sector is intense. The overwhelming trend has been the increasing efficiency with which gasoline is delivered to the consumer. The rapid entry of hypermarketers, such as Wal-Mart® and Costco,® into the retail gasoline sector is the most current evidence of the level of competition found within this segment of the industry. Prices, of course, can and do vary among stations for a host of reasons, including location advantages (e.g., with respect to the flow of traffic or proximity to locations like shopping malls that attract large number of motorists); cost differences among stations (e.g., rent, insurance, wages); and the commercial arrangements under which the station is supplied with product – again, to list just a few.

18 U.S. Energy Information Administration, Where Does My Gasoline Come From?, June 2005.

■ In the wholesale gasoline market, there are generally several different prices quoted, depending on the relationship between the supplier and retailer and on the terms, if any, of their contractual relationship. Thus, the wholesale price paid by different retailers can differ depending on such factors as whether there is a long-term supply agreement or whether the retailer has the right to use the supplier's brand.

Any retailer's pump price, however, must be competitive with local retail stations to attract customers. That is, retail pricing behavior ultimately is limited by the fact that pump prices are transparent and, therefore, readily known by motorists. Stations that set prices that are not competitive quickly lose business as motorists change their buying patterns.

There is a common, often implicit, belief that retail prices are or should be based on what the dealer has paid for the gasoline in his storage tanks. This misconstrues how competitive markets work. As noted above, prices for petroleum products, including gasoline, are a function of current as well as expected future supply and demand conditions, not historical costs. This is true even at the local level. If a retailer, for example, has relatively full tanks but other stations are forced to raise their prices due to increasing wholesale prices, the retailer will have an incentive to raise prices even before the retailer's own actual costs have increased based on the expectation that the retailer's future replacement costs will be higher. That is, the market is telling the retailer that the cost of gasoline has increased and, therefore, so has the retailer's cost of replacing existing inventory. (This is sometimes referred to as the retailer's opportunity cost: the retailer must replace whatever inventory is sold with higher-cost supply.) In contrast, however, when wholesale prices are falling and other retailers are lowering their prices, the same retailer faces the following stark choice: either lower retail prices (and, thereby, lower margins on existing inventory) or accept lower sales.

Of course, actual retail pricing decisions are much more complicated due, in part, to the multiple pricing-related factors noted above. What cannot be lost, however, is the fact retail marketing is a very competitive segment of the industry and, consequently, retail prices are forced to respond to that competition. The price changes arising as a consequence of the damage caused in 2005 by Hurricanes Katrina and Rita illustrate this point. Shortly after the storms, prices for all petroleum products, including gasoline, rose as a consequence of the damage suffered by Gulf Coast refineries. The expectation that the supply of products would be less readily available (which turned out to be true) gave rise to higher prices. As imports started arriving from foreign refineries and domestic refineries came back on line, prices once again declined.

The prices faced by U.S. consumers for petroleum products are largely a consequence of the world economy's stronger-than-anticipated growth, in the face of diminished excess capacity and increased supply uncertainty.

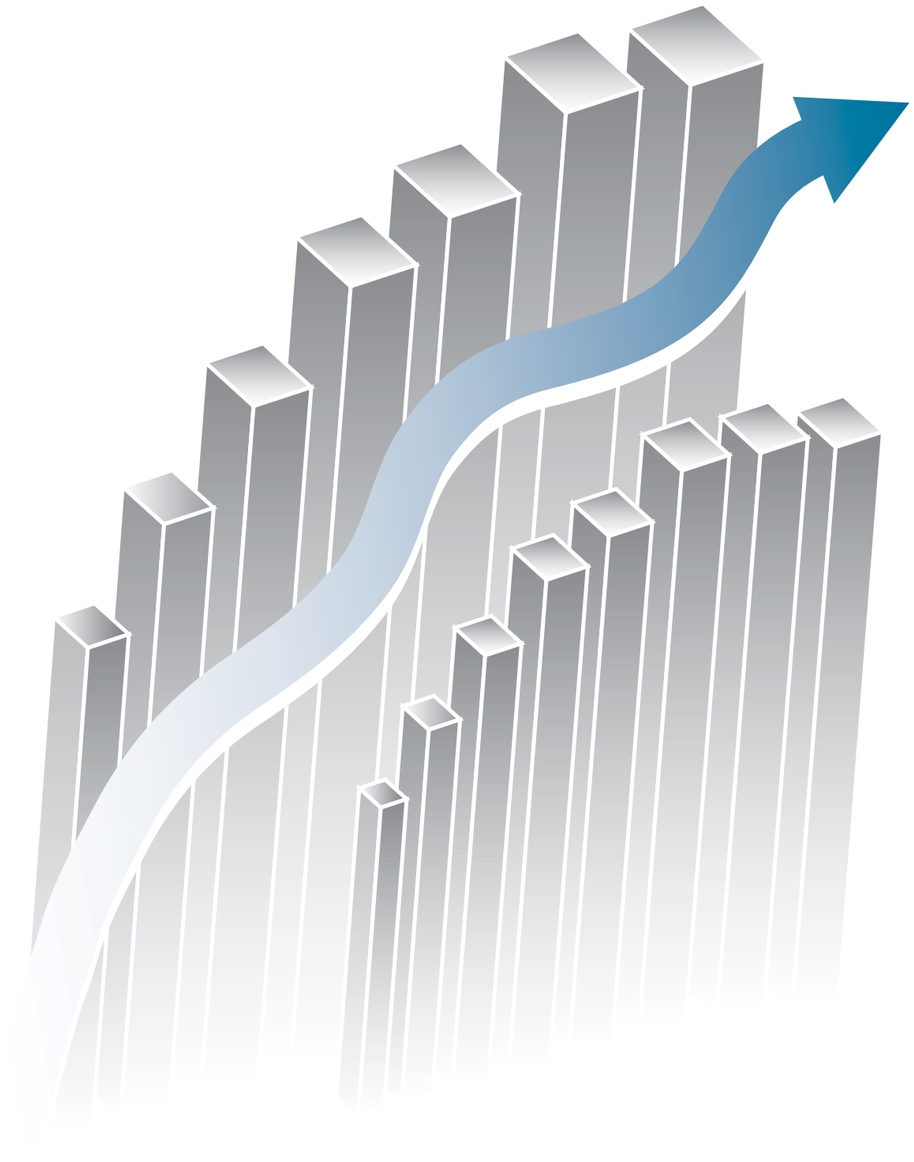
Growth

The markets determine the price.

Worldwide growth gave rise to stronger-than-expected demand for petroleum products critical to the global economy that, in turn, gave rise to stronger-than-expected demand for crude oil – demand that outpaced the near-term ability of the market to bring forth commensurate additional supplies. The resulting tightness in the global crude oil market caused prices for crude oil to increase. Specifically, prices for crude oil in both the spot and futures markets rose in order to bring the global supply of and demand for crude oil into balance.

The impacts arising from the increase in demand for crude oil have been felt throughout the chain of production. As demand for products increased, for example, so too did the demand for the refinery capacity necessary to turn crude oil into saleable products. As the utilization of the world's refineries increased, demand for those crudes more easily refined into the petroleum products desired by the world's economy (i.e., lighter, sweeter crudes) increased relative to those crudes more difficult to refine (i.e., heavier, more sour crudes). These changes have been reflected in the margins earned by refiners, providing the economic incentive to expand global refining capacity.

Moreover, and perhaps of most consequence, these changes in global supply and demand have increased the wholesale prices paid by retailers and, ultimately, the prices paid by consumers. Of course, any given individual retailer's prices will reflect the particular economic circumstances confronting that particular retailer, e.g., the station's location, commercial arrangements under which the station is supplied with products, and operating costs such as rent, insurance, and wages. What cannot be avoided, however, is the economic reality that U.S. retail prices are fundamentally determined by the world oil market.



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