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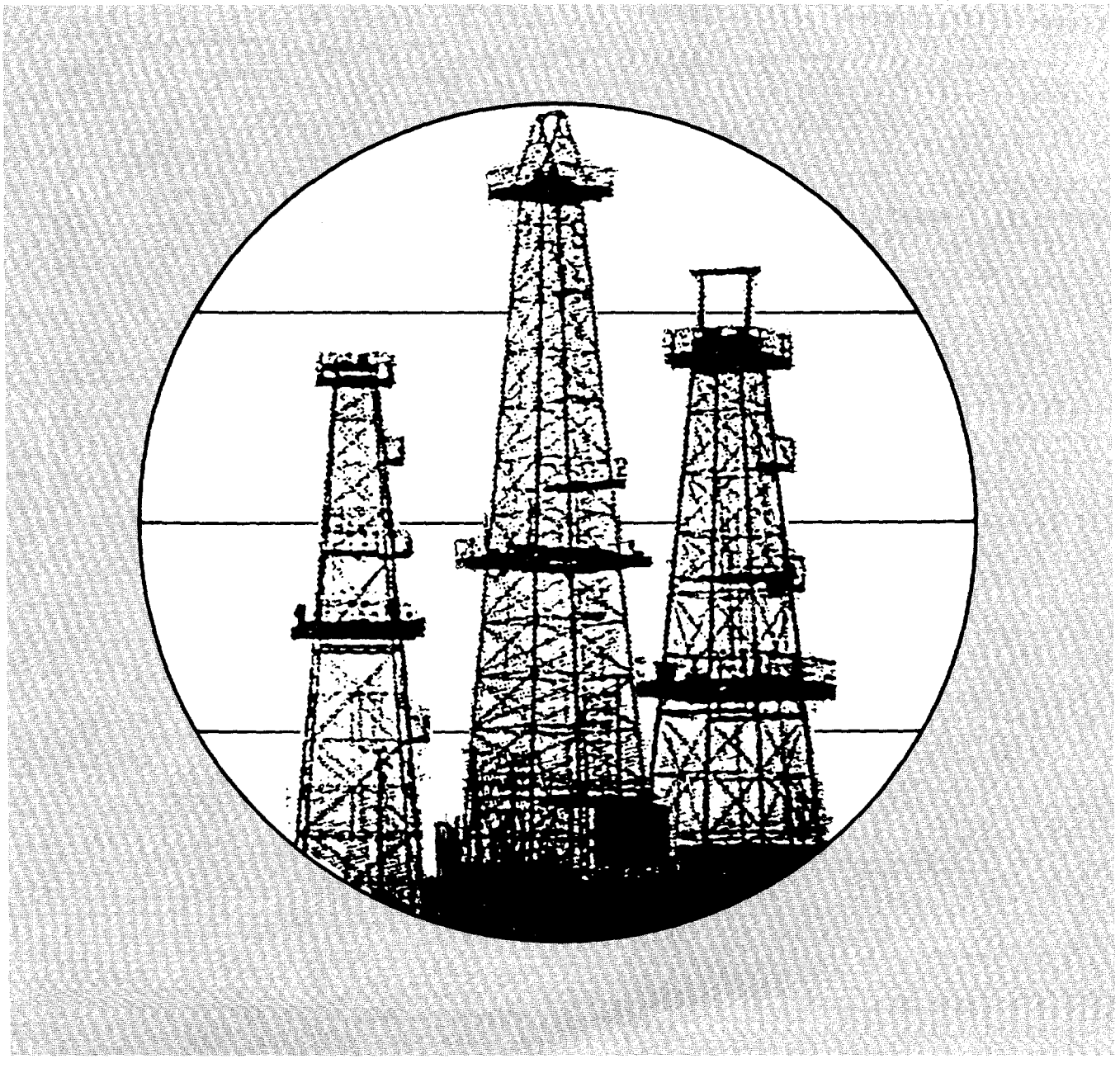
The New Era of Petroleum Trading

Spot Oil, Spot-Related Contracts, and Futures Markets

Hossein Razavi



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ABSTRACT

Until as recently as the early 1970s, the main channel for oil supply was the integrated system of the major oil companies. Each company had its own source of crude oil supply as well as the capacity to refine it. Petroleum products outside this closed system, either released from it due to imbalances between refinery output and market demand, or refined independently of it, constituted the basis for spot trading. The volume of spot trading was limited to around 5% of the total oil trade, while the remaining 95% was based on contracts specifying prices and quantities over relatively long periods of time. Even that limited amount of spot trading was conducted in a very simple manner. Most of the trade was in the form of uninvoiced exchanges and based on personal trust, characterizing an era that many oil company executives remember as the "good old days."

Today, spot and spot-related trades comprise some 80% to 85% of the internationally traded petroleum. Petroleum trading not only has developed into one of the largest worldwide commodity markets but has turned into an increasingly complex business. A spot trade involves millions of dollars and is carried out by sale and purchase agreements containing numerous safeguard measures. A cargo of oil may be bought and sold more than 30 times before reaching its final destination. Still, each seller or buyer may utilize "petroleum futures," "options on futures," and other financial instruments to hedge against the risk of possible price fluctuations. The interlinkages among spot trading, futures markets and contract sales have changed the nature of the petroleum business from its traditional straightforward production-oriented approach to a complex portfolio management environment.

Although the use of new trade instruments began in the early 1980s and almost all market participants are still learning, petroleum traders of developing countries have lagged behind those in the developed countries. This lag has resulted in the inability of these countries to procure their petroleum requirements at the lowest possible cost. While an individual entity responsible for petroleum distribution may be able to pass the cost to final consumers, the country as a whole would lose by not taking advantage of market instruments which are designed to lower the price or the risk associated with the price. In particular, since petroleum costs in most developing countries constitute a large component of the total import bill, the potential to benefit from the use of modern trading instruments is substantial.

Development of modern trading skills, like that of any other know-how, requires an action plan to build the needed institutions and train the

concerned staff. Before preparing an action plan, however, the staff, planners, and policymakers involved in petroleum supply need to acquire a fundamental understanding of the workings and the issues involved in the new era of petroleum trading. This report is intended to provide such an understanding. It provides a detailed description of petroleum spot markets, futures and options trading and their interlinkages with contract sales.

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CHAPTER 1

AN OVERVIEW OF PRESENT TRADING PRACTICES

Crude oil and petroleum products are traded in either of two categories: by contract (sometimes referred to as term sales) or by spot transactions. A contract sale, as the name indicates, commits the buyer and seller to trade oil over a set period of time and often at fixed prices. In the past, this period could have been as far ahead as three years. More recently, both the contract period and the price have been much more flexible. Spot sales, on the other hand, refer to very short-term trading, usually involving one cargo of oil per deal, with each deal struck at an agreed price for prompt lifting or delivery. Spot trading can thus be defined as a process by which cargoes of petroleum are exchanged on a day-to-day basis rather than under long-term contracts.

During the past four years, spot trading in petroleum has grown dramatically, from 10-15% of total volume traded in the international market to about 30-35%. In addition, a new wave of spot-related transactions which link the contract price to spot market price has emerged. These deals, which were virtually non-existent before the 1980s, now comprise an estimated 50-55% of total trades.

This chapter briefly reviews recent developments in the spot market and the interactions of this market with contract sales and futures trading.

The Underlying Forces Behind Development of Spot Markets

Since the age of barter economies, the starting point of trade for all grains and minerals has been the spot market. In this sense, a spot market is the "natural" market and the contract market is a special arrangement introduced at a later stage to cope with certain problems. The main problem with spot trading is that neither the producer nor the consumer can predict the price and quantity and thus are unable to plan their business. The extent of this problem is, of course, different for various commodities depending on the volatility of the market and the lead time needed for investment decisions. The most difficult trading situation, and the one typical of the oil industry, is that in which: (a) supply of the commodity, and thereby its price, are subject to manipulation; and (b) there is a long investment lead time for both producers and consumers, who may, in turn, use this commodity to produce other goods. Faced with the unpredictability of spot trading and the problems it poses for planning, both producers and consumers search for contractual arrangements that provide predictability in price and quantity over a specified period of time. Thus, the develop-

ment of a contract market is mainly a response to the need for planning of business activities on the part of both the producer and the consumer.

While contracts facilitate the planning and management of businesses, they take away flexibility. Term contracts are normally made for long periods of time and at predetermined prices. When business conditions are relatively stable, the rigidity of these contracts is acceptable. But when markets become unstable, rigid contracts can hinder efficient business operations. The attempt to balance the benefits and drawbacks of both systems has resulted in two approaches to trading. In the short and medium terms producers and consumers need flexible arrangements, combine spot and contract trading in their portfolios in order to keep some flexibility (through spot trading) while preserving predictability (through contract trading). The composition of such a portfolio will vary among business entities and over time. As a result, the industry's trade, at the macro level, will undergo periodic shifts between spot and contract trading. In the long run, the industry will embark on a search for "more flexible contracts." This would include contracts with flexible pricing and delivery arrangements as well as contracts which can be sold to a third party. There is, of course, a limit to this flexibility. If contracts were to become too flexible, they would no longer be contracts.

The search for flexible contracts will eventually lead to the introduction of futures markets. These markets will, indirectly, provide contract trading with price flexibility and transferability options while allowing contracts to be based on long-term delivery and fixed-price conditions.

After futures markets are incorporated into overall trading practices, both buyers and sellers are better off to return to long-term contract trading, as this type of trading can be combined with futures market activity to keep the flexibility needed to cope with the changing business environment. The extent of this return would depend on how fully futures markets have developed. If they are worldwide and cover a sufficiently long period of time into the future, then there is little incentive for spot trading. Under such circumstances, most sellers and buyers find it advantageous to use contract trading; the spot market's role will then diminish to a residual or balancing market. However, in practice, there are limitations to the development of futures markets in terms of geographical coverage, lead time, and product coverage, and thus the return to contract trading will remain far less than perfect.

Various Stages of Development of Petroleum Spot Markets

Spot transactions in oil have been around for as long as the industry itself. However, today the spot market is normally taken to refer to spot

trading in Rotterdam, New York Harbor, and a few other centers. These markets have become established only in the past two decades. They have developed in four distinct stages:

STAGE 1: THE SPOT MARKET FUNCTIONING AS THE RESIDUAL MARKET:

Almost all oil companies face the problem of matching their refinery outputs with the market's current demands for various products. They have deficits of some products and surpluses of others. The company may balance these deficits and surpluses through the use of storage and/or shipment facilities. But quite often it is more economical to balance them by swapping or selling and buying some products on the spot market. This was primarily the function that the spot market served at its early stages of development in the 1950s and 1960s.

The role of the spot market at this stage can be described as a residual channel of oil trade. The main channel for oil supply was the integrated system of the major oil companies: each company had its own supply of crude oil as well as the capacity to refine it. Petroleum products outside this closed system, either released from it due to imbalances between refinery output and market demand, or refined independently of it, constituted the basis for spot trading. The volume of spot trading was limited to around 5% of total trade, while the remaining 95% was based on contracts specifying prices and quantities over relatively long periods of time.

STAGE 2: SHIFT FROM A RESIDUAL TO A MARGINAL MARKET:

After the 1973-74 crisis, the spot market began to play a marginal role in petroleum trading, that is, small but significant trading as opposed to the small and insignificant trading of the residual market. The significance is, of course, in terms of the impact on the main (contract) market. When the spot market serves a residual role it basically follows contract prices (usually with a discount or a premium) without significantly affecting these prices. But when the spot market serves a marginal role, it becomes an indicator of overall market conditions. As in any other business, when decisions are to be made in the petroleum industry, decisions are determined by marginal results. The cost and revenue of producing or processing the marginal barrel constitute the basis of decision making in many planning areas--especially in refinery operations.

The spot market's shift from a residual to a marginal market occurred in 1975-78 when low spot prices were used as indicators of soft market conditions by both the petroleum industry and the governments of consuming countries (to set price control policies). The shift accelerated after 1979

when it was demonstrated that the spot market could play this role in both tight and soft market conditions.

STAGE 3: TURNING INTO A MAJOR MARKET:

Despite the significance of spot transactions to the industry's planning and pricing policies, their volume remained small during the second stage of market development. It was only after 1983 that spot and spot-related trade started to grow appreciably. By 1985, spot and spot-related transactions were thought to account for 80-90% of internationally traded oil. Several factors have contributed to this rapid growth. First, excess capacity in the refining industry has forced refiners to fight for their survival. Refiners were forced to use the most economical way of procuring crude oil. They increased their refinery throughput to the point where the price of a marginal barrel of product covered the marginal operating cost. This brought about a shift from term-contract arrangements to spot purchasing of crude to take advantage of flexible (declining) spot prices compared with rigid contract prices. It is also becoming a common practice to "refine for the spot market." That is, despite a tradition of refiners' determining their level of operation in the light of market demand and selling only surpluses on the spot market, excess capacity has now forced many refiners to refine and sell on the spot markets as long as they can cover operating costs.

Second, as OPEC countries began to lose market share, they began to engage in so-called "spot-related" sales to recapture lost sales. These spot-related sales included variable price contracts, barter trade, netback pricing deals, etc.

STAGE 4: PARALLEL FUNCTION WITH FUTURES MARKETS:

Markets in petroleum futures developed in response to instability in spot prices. The first-generation of petroleum futures, including a crude oil contract on the New York Cotton Exchange and a Bunker C and gas oil contract on the New York Mercantile Exchange (NYMEX), were introduced in 1974.

None of the first generation contracts attracted the petroleum industry, and all faded into obscurity. The most important reason for this failure was that petroleum prices did not fluctuate as expected. The international spot price of crude oil stayed between $10.30 and $10.40 a barrel during the period from October 1974 to December 1975. Price stability was further reinforced in the United States by the Energy Policy and Conservation Act (1975) which, by limiting the annual increase in the crude oil price, led to reasonable predictability in petroleum prices.

The second-generation of petroleum futures started with the introduction of a heating oil and heavy fuel contract on NYMEX in November 1978. The heating oil contract was a success because:

- o fuel oil had been exempted from price controls in more than 40 U.S. states in 1976;
- o the international price of oil became very volatile after 1978; and
- o the complete deregulation of the U.S. oil price by the Reagan administration in February 1981 forged a stronger link between U.S. prices and volatile international prices.

The success of the heating oil contract encouraged NYMEX and other exchanges (Chicago Board of Trade, Chicago Mercantile Exchange, and International Petroleum Exchange of London) to introduce other petroleum futures. Among them, the crude oil contract introduced on NYMEX in March 1983 was the most significant: it expanded the potential for trading petroleum futures and substantially intensified the interaction between the futures and spot markets. Indeed, it was after the introduction of this contract that the petroleum industry began to take futures trading seriously. The significance of this contract was in:

- o its "cash market," i.e., the spot crude oil market, being one of the largest commodity markets in the world;
- o the complementary role of this contract in providing the industry's requirement of a crude/product mix of contracts before effectively utilizing petroleum futures for hedging purposes;
- o the fact that it soon developed into a price signalling channel for the traders of crude oil, especially in the United States.

At Stage 4, petroleum spot markets and futures trading are both still growing and increasing their roles in the industry's decision-making process. At the same time, the two markets interact, compete, and complement each other. As has been the case in the development of other commodity markets, the coexistence of spot and futures trading is a sign of a maturing market.

Interactions with Contract Markets

In general, interactions between contract markets and spot trading are numerous, complicated, and difficult to comprehend. However, in the case of petroleum, the traditional structure of the market and, in particular,

the different behaviors of the independent companies and the major oil companies, facilitate the analysis of these interactions. Although it may no longer be the case, for almost two decades the pricing policy of the major companies was associated with contract markets while the independent companies followed spot market directives. Beginning in the early 1970s, contracts were signed between the major companies and the governments of oil producing countries which had taken over the production of crude oil. The companies would then refine the crude in their own refineries or resell it to third party customers, including some independents and government-owned companies in consuming countries. Thus, the major companies were the main channel of contract trading in the petroleum market. The independent companies, on the other hand, bought some of their requirements from the large companies but relied heavily on the spot market.

The flexibility of the independents in adjusting between sources of supply provided them with an opportunity to gain from spot trading under soft market conditions. They utilized this opportunity very effectively. For example, during the slack period (1975-78), independents were able to buy cheap crude and products on the spot market, and undersell the majors' retail outlets in most of Europe. However, the spot market dependence made them also vulnerable to volatilities of spot prices under tight market conditions. This was experienced in 1979 when independents were forced to buy expensive supplies on the spot market and resell them at retail prices which, although they barely met the cost, were much higher than the majors' low prices based on cheaper contract supplies.

The interface between the majors and the independents in the retail market provides a useful exposition of the interactions between the spot market and the contract market. These interactions are based on two principles: (a) the relative positions of the average and marginal cost curves under soft versus tight market conditions; and (b) the difference between the weighted average cost of supplies to independents and the majors. These principles, explained below, are the main vehicles through which spot and contract prices interact to bring about an equilibrium price at the retail level. The retail price will then work its way back to the crude level decisions (quantity or price adjustments).

One of the basic tenets in economic theory is that in order for a producer to maximize profits, he should expand or limit production to the point at which the revenue from the sale of the last unit (marginal revenue) is equal to the cost of producing it (marginal cost). Although the oil industry's long-term decisions are guided by this principle, its short-term decisions are much more constrained. An oil company has customers to serve and a market share to protect. Therefore, it cannot change its supply level very freely. Yet the marginal cost of supply may change every day and the

company has to do its best to cope with its market obligations while trying to maximize its profit. Figure 1.1 shows the relative positions of average cost and marginal cost curves under soft and tight market conditions. Under soft market conditions, the average cost to each company remains constant up to the level of contracted supplies. This is basically the traditional take-or-pay contract which obliges the company to buy a specified quantity of crude at a contracted price. Beyond the level of contract supply, the company can go to the spot market and buy the additional crude at a cheaper price. Therefore, its marginal cost is below its average cost. As it buys more on the spot, the average cost of its crude supplies will be reduced but still remain above the spot crude. Thus, an independent company, which has fewer contract obligations than a major, can acquire its crude supply at a lower average cost by depending more on spot supplies. Under tight market conditions, the opposite situation would prevail: the marginal supply of crude would be procured on the spot market at a price higher than the contract price.

Based on its mix of spot and contract supplies, and under certain regulatory constraints in most countries, an oil company has to set its retail price high enough to cover its costs and low enough to compete with the retail outlets of other companies. This price would, on the cost side, depend on the weighted average cost of spot and contract supplies. This is true for both major companies and independents. However, the weight is different for each group. The contract price has a higher weight in the case of the majors while the spot price has a higher weight for the independents. This is the principal vehicle which brings about an equilibrium in the retail market.

For example, if the contract price is substantially above the spot price (soft market conditions), the independents' purchases of spot crude (and products) enable them to sell their products at a lower price in the retail market. The majors' cost structure would require selling at a higher retail price, but they have to lower their price in order to preserve their market share. This interface in the retail market would lead to an equilibrium price at the retail level. The resultant retail price would yield a netback value on the basis of which the companies have to adjust their crude/product purchase policy. The process would eventually affect producers' supply decisions in the form of a change in quantity and/or price.

In the past, the separation of the majors' and independents' channels of crude (and products) supplies allowed the spot/contract interaction process to serve as a system of checks and balances. When the gap between contract and spot prices widens, costs to independents and to the majors become very different. The cost difference is initially reflected in different prices

on the retail market which would, over time, converge to an equilibrium price.

In future, the interaction process will remain essentially the same but the number of players (or groups of players) will increase. Spot trading is no longer limited to independent oil companies; many majors, state-owned oil companies and OPEC producers are becoming involved in spot or spot-related trading. As a result, the market is becoming more fluid. The market disequilibriums show themselves rapidly and need to be taken care of equally quickly. That is, the contract/spot interaction mechanism is becoming more efficient as a larger number of entities (on both sides of the trade) are learning how to use the spot market.

Interactions with Futures Markets

Having developed into a major market, spot trading serves three important functions for the industry. First, it provides information about market clearing prices of crude oil and petroleum products. This information is extensively used by producers, refiners and traders. The sources and reliability of this information is discussed at some length in later chapters. At this stage we need only point out that this information is not based on comprehensive surveys or even representative sampling of trade activities since there is no formal administrative body or a physical trading floor to register spot transactions.

Second, the spot market functions as a medium for transferring or sharing the risk associated with price fluctuations. If a stockholder fears a drop in the value of his inventory from a decline in prices, he can sell part of it on the spot market. The buyer will purchases the oil in anticipation of profiting from an increase in the prices. A significant portion of the spot transactions of the late 1970s and early 1980s was due to speculative stocking and destocking of crude and refined products.

Third, as was discussed earlier, the spot market is now an alternative channel of oil trade. The volume of spot transactions, especially of crude oil, during the last few years increased very sharply. The disruption and tight supply conditions of 1979 forced the purchasers of crude and refined products to learn to use the spot market. The reduced demand of the 1980s, on the other hand, has forced producers to sell their oil on the spot market. Thus, with both sides of the market trading in the spot market, a reversal of the present trend becomes unlikely. Further, there will always be an incentive for one of the two sides to trade on the spot.

Petroleum futures are likely to take over two of the three important functions of the spot market. These are the price discovery and risk

transfer functions, both of which the futures market can perform more effectively than the spot market. Regarding the price discovery function, the petroleum spot market is geographically and organizationally dispersed, making collection of an accurate and representative sample of spot prices difficult, if not impossible. In addition, there are institutional limits to processing and disseminating the data collected, which is treated as privileged information available only to those willing to pay for specialized market services. The information provided by the spot market thus suffers from inherent statistical deficiencies. The futures market, however, is not so constrained. Unlike spot transactions, futures contracts are traded on formally organized commodity exchanges. The transaction data are compiled very rapidly and disseminated almost instantaneously; they are available to the public and there are no institutional barriers to their distribution. The futures market is therefore capable of removing, or at least lessening, the impediments that exist to the flow of information in the petroleum industry. In this respect, spot market price information will lose its significance as the futures market is recognized as a more convenient source of price information.

The risk transfer function of the spot market can also be performed more efficiently by the futures market. Indeed, the risk transfer potential of the spot market has always been less than that desired by the industry. The participants in the spot market are petroleum business agents either directly or indirectly involved in the production, processing, distribution and consumption of petroleum. They normally try to avoid risk in order to manage a smooth operation. During a soft market period, they want to avoid the risk of a capital loss due to a decline in the value of their stock. During a tight market period, they want to avoid the risk of paying too much for supplies. For these agents to avoid risk through spot market trading, there should be enough speculators willing to accept the risk. The majority of these risk takers normally come from outside the industry. However, since spot market transactions require substantial capital and specialization, outsiders are not likely to participate in spot trading. Even if they have the capital, they would not know what quality of petroleum to look for, from whom to buy the oil, where to keep it, and to whom to sell it.

Futures trading removes most of the barriers to the entry of outside speculators in petroleum trading. It provides two important facilities: standardization and impersonality. Futures contracts are standardized with respect to quality, quantity, and location of delivery. Participants do not need to know much about the technical characteristics of petroleum. Also, futures contracts are impersonal in that traders do not need to know who is on the other side of the trade. The clearing house of the futures exchange assumes the role of buyer to all sellers and the role of seller to all

purchasers of contracts. Furthermore, a trader may participate in a futures market by investing as little as a few thousand dollars.

The facilities provided by the futures market for speculative trading will be clarified in Chapters 5 to 7. At this stage, it is important to note that the standardization and impersonality of the futures market stimulate the participation of speculators and thereby increase the possibility of transferring the risk. A fully developed futures market would serve this function much more efficiently than the spot market.

The third function of the spot market, to serve as a channel of petroleum supply, cannot be taken over by the futures market because, as will be explained in Chapter --, futures contracts are not a convenient way to trade petroleum physically. However, the physical supply of petroleum is affected by futures markets in two different ways. First, in the short and medium terms futures markets provide instantaneous information on prices which considerably facilitate spot trading. Today, most spot trading in the United States is based on futures prices. Second, in the long run, futures markets, if fully developed, will reduce the scope for spot trading since futures markets can, in practice, provide all the flexibilities that spot trading can offer. Therefore, both sellers and purchasers will be able to return to contract trading as a basis for making investment decisions and use futures markets to preserve flexibility in their business operations. This is, however, dependent on the future worldwide development of petroleum futures markets covering crude oil as well as major petroleum products.

CHAPTER 2

MECHANICS OF SPOT TRADING

How It Works

The spot market is not a formal institution. It is an informal worldwide network of personal and professional contacts carrying out cargo-by-cargo sales and purchases of crude oil and petroleum products. Significant refining or storage centers such as those in Rotterdam, New York or the Caribbean are likely to be the scene of spot transactions and price quotations, although market participants can be located anywhere, as can the oil traded. The cargo being traded can and usually is already at sea. Participants do not meet to match bids and offers; the transactions take place through telexes of trading offices.

The transaction process has become increasingly complex. In the 1950s and 1960s most of the trade was in the form of uninvoiced exchanges. This was acceptable at a time when only a few companies were involved and trading was based on personal trust. After the oil price hikes of the 1970s, it became impossible to conduct business on such a basis. The cargo became too valuable to be secured by simple trust, which itself became untenable by the entry of numerous small traders. Today, there is very little uninvoiced exchange. Instead, a spot trade involves millions of dollars and is carried out by sale and purchase agreements with a host of safeguard measures. Since a typical cargo of gasoil, i.e., 20,000 to 24,000 tons, is worth about $4 million and a typical cargo of crude may be worth at least $20 million, banks are involved in any transaction, insurance arrangements have to be made, and quality and inspection procedures must be defined in detail.

Even so, disputes still arise. The most common are:

- o non-delivery or non-lifting - normally in periods of sharp price change based on alleged or real force majeure, etc.;
- o delayed delivery;
- o quality disputes and price differentials;
- o inspection disputes;
- o payment disputes; and
- o bankruptcy disputes.

Product spot trading is a much longer established process than spot trading in crude. Worldwide, only 1-3% of crude oil was traded on the spot market before 1979. The proportion has since increased to an estimated one third of all crude oil traded internationally.

It is difficult to calculate the quantity of petroleum (crude or products) moving through spot channels. Due to multiple exchanges between traders, the volume of trade is always much larger than the amount of oil actually delivered. Each shipment is traded several times before reaching the final consumer, and each time it is added to the statistics on the volume of trade. A remarkable example of spot trading involved the "daisy chain" trading of a cargo of Brent crude traced by Petroleum Intelligence Weekly in 1984. The trade involved one cargo of crude oil bought and sold by 24 trading entities in 36 transactions over a period of three months. The trade for March 1984 delivery started in January. The 24 trading entities involved included major international oil companies, national oil companies, refiners, and independent marketers and traders. [From the majors companies, Shell appears three times (as Shell U.K., Shell International and Pecten), British Petroleum (BP) appears twice, and Chevron and Texaco once each. Two national oil companies, the British National Oil Company (BNOC) and Finland's Neste, were also involved, as were four U.S. refiners--Occidental, Sohio, Charter, and the final buyer, Sun. Charter's trading affiliate, Acron, alone accounted for four transactions, and Charter itself for one. U.K. independents, Tricentrol and Ultramar, also participated as did the Japanese refiner, Idemitsu.] Trader Phibro appears six times in the chain, Transworld and the Shell group three times each, and several others twice.

This example occurred during a time of speculation, and probably involved a larger than average number of transactions. But the nature of the chain is typical. [Many companies trade a single cargo, and some of the repeaters in the chain do not realize they are trading the same cargo.]

Market Participants

"Majors are becoming traders, the traders are becoming brokers... and brokers are becoming journalists."

Petroleum Intelligence Weekly, January 20, 1986

Participants in petroleum spot trading can be broadly classified into: (a) major oil companies; (b) independents; (c) petroleum traders; and (d) brokers.

THE MAJOR OIL COMPANIES:

Major oil companies used to regard the spot market as a last resort to procure needed supplies or dispose of surpluses. In each refinery run there is always a mismatch between output and demand. Majors formerly balanced these mismatches either redistributing the surpluses within their own extensive system or correcting the mismatches through the spot market. But in the last five years the economics of the operation have forced the majors to make their refining/marketing systems more flexible. If the product yield of a barrel of crude oil can be bought more cheaply in the spot market than it can be produced in a company's own refineries, it is economical to reduce refinery runs and buy products from others at spot market prices. Moreover, the availability of crude to major oil companies, which far exceeded their product sales until mid-1970s, is now less than total product sales.

The trend toward buying rather than refining on the part of majors can be observed in the table below. Today, product purchases from others account for 30-40% of total sales by most major oil companies. Much of this growth is met by smaller independent and state owned refineries.

The increased reliance on spot markets by major oil firms is not confined to products. Majors are now actively involved in trading crude oil as well. Much of this began in 1979, when contract supplies were curtailed by producing countries. Majors could either accept a reduced share of the product market or purchase expensive crude on the spot market, refine it, and sell at a loss. They chose the second option. In late 1979, majors became the biggest buyers in the crude spot market: no other potential buyers had sufficient contract oil at low prices to support high priced spot purchases. Immediately after the 1979 crisis, there was a scramble among majors to secure as much contract crude as possible. As the market softened, and spot prices fell below official prices, spot or spot-related purchases of crude became more attractive than term contracts. Today, outside North America, majors account for about 19% of spot trade and acquire 20-30% of their crude supplies on a spot basis. The spot share is lower in North America where most large companies have their own crude supply.

To deal with the changed situation, majors have set up their own trading affiliates and become involved in complex trading exercises. For example, Shell's trading affiliates are not only involved in spot trading but compete among themselves, and even with Sitco, Shell's central trading unit. Shell has recently split its crude trade activities geographically into Atlantic and Pacific Basin regions. Mobil has reorganized its trading activities to separate the functions of crude and product trading among its subsidiaries.

THE INDEPENDENT OIL COMPANIES:

Independents have always played an important role in spot trading. They were to a large extent the driving force behind the creation and growth of spot markets. Unlike the majors, the independents have always depended on the spot markets for much of their needs. In soft market conditions, this has worked to their advantage. For example, in the slack years between 1975 and 1978 the independents purchased cheap products on the Rotterdam market and undersold the majors' retail outlets in many European countries. However, this dependence became a major disadvantage in 1978-79 when supplies to the independents were cut back as the majors passed on OPEC supply cuts to their third party customers. The independents were then forced into the spot market and had to buy their supplies at much higher prices than the official prices charged to the majors. Initially, the retail market settled into two price tiers in some European countries. In West Germany, for example, the majors' low prices and the independents' high spot-related prices coexisted in the retail market. As the majors secured more contract oil, they enlarged their market share, squeezing the independents out of the market. The extent of harm to independents, however, varied from country to country. In West Germany, government officials obliged the majors to provide "life boat" supplies to independents. In Italy, the independents were badly hurt.

Despite these setbacks and the growth in the number of spot market participants, the independents remain a vital part of the spot market, accounting for about 11% of the total spot crude transactions monitored by Petroleum Argus in 1986-87.

TRADERS:

The number of traders involved in the oil business was very small until the late 1960s when more trading companies entered the field as demand grew and supply diversified. Trader participation became particularly intense after the crisis of 1973-74, since the costs of entry into the industry (basically a telex and telephone) were low and the potential rewards were high. As a result, the number of traders proliferated to more than 300 in the Rotterdam area alone, though the trade was dominated by those with access to crude and products at the same time. During the slack period of 1975-78 a large number of these traders went bankrupt. Again, the 1979 crisis encouraged some new entrants, while the subsequent slack period saw increased spot activity.

A trader's basic function is to "take up positions" with regard to crude oil and petroleum products. That is, he contracts to buy or sell real cargoes of oil and is fully responsible and liable for the cargo. Once a trader has

taken title to a cargo, he must sell the cargo, exchange it for another cargo, or store the cargo once it reaches the port of delivery. The least risky operation for a trader is a "back-to-back" deal, i.e., where both seller and buyer have been arranged in advance. In such deals, the trader behaves very much like a broker, buying and selling almost simultaneously. If he foresees a price rise, a trader may buy a cargo without the immediate security of a buyer; by doing so, he would take a "long position." Conversely, when prices are falling, a trader may decide to arrange a sale, without having the oil in his possession, in anticipation that nearer to the date of completion he will be able to purchase the oil at a lower price. This is called "selling short." Some traders may have their crude oil refined and then sell the products partly on the spot market and partly under contract or multi-cargo arrangements. Finally, some traders take advantage of seasonal demand for heating oil, purchasing it cheaply in the summer, storing it, and selling it in winter when demand and prices are up. The price fluctuations of recent years have made the profitability of seasonal trading more uncertain.

Today, international petroleum trading is concentrated in the hands of a few large reputable trading companies like Phibro, Marc Rich, Bulk Oil and Transworld Oil which account for more than half of the business done by traders. At the local level, a large number of sporadically active traders are involved. These small, peripheral traders enter and leave the business in response to the margins available. When prices are fluctuating, margins widen, motivating more traders to enter the market. When spot product prices rose explosively in 1978, some traders acquired fortunes overnight. But in 1979 when traders were paying greater and greater premiums over current prices to secure scarce cargoes, the spot market turned down--especially in gasoline--and many small traders went bankrupt. When prices stabilized, the volume of trade shrunk and survival, rather than profit, became the traders' main objective.

BROKERS:

Brokerage firms are often one-man operations, mostly operating out of London and New York. Many are general brokers for whom oil is only part of their business. Unlike a trader, the broker holds no title to the cargo traded, but is a paid go-between who discovers availability or needs and brings together buyers and sellers. Brokers are compensated on a commission basis, and are therefore not exposed to the risks involved in price fluctuations. The commission is normally specified in dollars per ton and is paid by the seller.

Brokers are a useful source of market intelligence as they need good knowledge of the market in order to operate and are prepared to impart such

information in return for an occasional commission. They also have a different relationship with their client than traders. For the trader, clients are adversaries since he makes his profit by purchasing cheaply and selling dearly at their expense. The broker, on the other hand, operates from a position of neutrality and, as such, is less controversial than the trader.

The Rotterdam Market

Spot trading in general is often referred to as the Rotterdam market. This association arose because Rotterdam was the birthplace of petroleum spot trading because of its extensive oil production, storage and distribution facilities. Rotterdam has always been the most active spot market as well as the only market which both imports and exports large quantities of spot crude and products. It also plays a central role in the world spot market. However, any reference to the Rotterdam spot market embraces all spot trading concluded in northwestern Europe--Sweden, Denmark and Norway, the east coast of England, the Federal Republic of Germany (FRG), the Netherlands, Belgium and northwestern France. Furthermore, all spot transactions taking place elsewhere in the world, but relating to crude oil or products stored in Rotterdam, or destined for or leaving one of the above countries, are normally regarded as transactions on the Rotterdam market.

Logistically, Rotterdam trade consists of two distinct but related segments:

- an international cargo trade via large oil tankers which takes place between Rotterdam and ports throughout the world, but especially those in the North Sea area; and

- a barge trade from Rotterdam and the Rhine delta to consumers in the Netherlands, West Germany, Belgium, Switzerland and France.

Rotterdam links these two traders together by providing facilities for breaking cargo shipments into barge lots.

Development of the Rotterdam market has been closely related to developments in the petroleum industry itself. Rotterdam first became significant to the oil trade in the early 1960s with the discovery of Libyan crude supplies by U.S. independents. These discoveries represented a substantial source of low priced crude oil outside the majors' closed system. Barred from the U.S. market by import quotas, this oil was diverted to the large and rapidly growing European market; independent refining and trading of petroleum products was then developing in Europe, and particularly at the port of Rotterdam.

Rotterdam's geographic position made it a particularly attractive center for oil trading. Located at the mouth of the Rhine, it offers independents easy access to the hinterland markets in Western Europe as well as to overseas markets. And deep-water as a port, Rotterdam can accommodate large oil tankers. Recognizing these attractive features, major oil companies, joined the independents by gradually developing their swing refining capacity there. These developments took the Rotterdam market through its birth and infancy.

The second stage of Rotterdam's development began with the 1973-74 oil embargo and continued until 1978. High petroleum prices and the recession of 1974-75 depressed petroleum demand and left the Rotterdam market with excess capacity in all its operations. At the same time, demand shifted towards lighter products and the less sophisticated refineries became unprofitable to operate. The market forced these refineries to run at lower rates of utilization, and their operators to meet product shortages (and to dispose of surpluses) in the Rotterdam market. During this period the market was also recognized by the governments of many European countries as a "free" market for petroleum, on which many domestic price control policies could be based.

The third stage of Rotterdam's development started in late 1978, when the market there became recognized as the barometer of global oil demand and supply. At this time, the price of crude moved towards its peak of $40 a barrel. OPEC and non-OPEC producers began to use information from the Rotterdam market to set increases in prices, and justified the increases by the growth in market demand exhibited by Rotterdam prices. Actual trading on Rotterdam was very thin, but it was viewed, at least by producing countries, as the only valid reference point for the demand/supply balance. This view was not shared by consumer states, which were irritated that such a small portion of total supplies, not even representative of Europe as a whole, could be given such disproportionate importance.

Concern about the effects of high Rotterdam prices on the world economy prompted the governments of industrial countries to seek ways to control the market. The leaders of six major oil importing countries (the United States, Federal Republic of Germany, France, Italy, Japan and the United Kingdom) pledged at the Tokyo summit in June 1979 to try to moderate Rotterdam market activity. At the same time, the European Commission undertook two separate examinations of the Rotterdam market. The first was the reintroduction of a register of spot transactions that had been carried out for six months in 1978 under the name "checkrun." The new register, called "Comma" (Commission Market Analysis), ran from June 1979 to May 1980 with the voluntary participation of the industry and the aim of providing a deeper understanding of the Rotterdam market's structure and operation.

The second examination organized by the Commission was undertaken by a group of experts from various parts of the oil industry. Called the "Bourse Group," these experts studied the possibility of establishing a formalized trading floor for oil. The outcome of both examinations was, in effect, an endorsement of the Rotterdam market as a more or less free market for petroleum. The Commission decided that neither a continuing monitoring of spot transactions nor the creation of a petroleum trading floor was necessary. It should be noted that by the time these investigations were completed prices had softened substantially, and Rotterdam had turned from a sellers' to a buyers' market.

Today, Rotterdam is still considered the most important oil trading center of the world, and its prices still represent the reference point for market analysis and many trade agreements. However, Rotterdam is no longer the only important spot market; there are growing spot markets in the United States, the Far East and the Persian Gulf. In addition, the rapid growth of the futures market in the United States has shifted some attention away from Rotterdam prices and to the price of West Texas Intermediate (WTI) crude on NYMEX.

Other Spot Markets

Partly in response to growth in spot trading, as well as to other developments in the oil industry, spot markets are growing rapidly worldwide. U.S. spot markets increased in importance after the deregulation of petroleum prices by the Reagan administration in 1981. The Far East markets have become rather well established and the Persian Gulf markets are expanding quickly. However, the most influential of these are the United Kingdom Brent and the Singapore spot markets.

THE BRENT MARKET:

The Brent market is a recent development in oil trading. It includes both spot and forward trading. The development of this market took place during 1981-82 in response to a number of factors, the most important of which was the incentive for selling the crude oil in advance of its production in order to avoid the risk associated with falling oil prices. At the initial stage, trade was limited to actual oil (wet barrels) even though a specific cargo could have changed hands several times before the delivery. However, by the end of 1982, the market expanded to cover a large number of paper deals which were struck based on speculating future prices and were closed before delivery.

The development of the Brent market was initially due to the coincidence of: (a) the interest among traders to "sell short"; and (b) the willingness by

a number of oil companies to sell their equity oil into the spot market for tax purposes. The interest among traders to sell short was due to the expectation that crude prices would fall and the hope that the trader would be able to buy the oil he needed to fulfill his obligation at a price lower than the price at which he had sold the oil. The oil companies' incentive to sell into the spot market emerged from the fact that, prior to the 1987 revisions in tax laws, oil companies were able to pick the lowest priced cargo, from many sales over a period of several months, as equity oil on which upstream taxes would be paid. In this manner, oil companies could minimize tax liabilities through multiple buying and selling of their equity crude. There was, therefore, a match of incentives; the trader would sell short and then balance it from forward sales by the oil companies. In other words, at this stage, short-selling also meant forward selling.

In 1982, short-selling went beyond forward selling of future oil supplies. It instead started to include sales which were not really intended for end-users but to be closed before the date of delivery. In this regard the Brent market started to serve like a futures market although the Brent market is not formally institutionalized and regulated.

The Brent market is frequently called a trading club. There is a limited number of participants who know each other. Contracts are large (500,000 barrels of 38^{o} API, low-sulphur Brent blend) and are negotiated directly between participants. There are no membership requirements but the ability to enter the actual deal depends on the identity and reputation of the participant. All deals are made verbally and a telex confirmation follows. The terms of transactions are not disclosed and not registered anywhere. There is no clearing house. Contracts are series of pair-wise deals. Each contract involves a binding commitment to buy (sell) the actual oil and will be executed unless the contract is cancelled sufficiently ahead of delivery time and through an explicit "book-out" agreement. Thus, trading of "paper oil", i.e. a transaction with no intention of delivery, is much more complic ated in the Brent market than in a typical futures market like NYMEX.

There are two types of transactions in the Brent market: a dated cargo and a 15-day cargo. The dated cargo is a sale/purchase agreement for a specific cargo of oil within a specified date range. Thus, it is a spot transaction like those in Rotterdam or elsewhere. The 15-day cargo is a forward transaction. It is a sale/purchase agreement for a cargo of oil to be delivered on an unspecified day of a specified month. Thus it would not refer to a specific cargo of oil but would only specify, for example, August Brent. The actual delivery date will be determined at a later stage by the seller with a minimum notice of 15 calendar days. (This is where the title of 15-day cargo comes from.)

The dated cargo involves a physical transaction in which a specific cargo actually changes hands. The 15-day cargo, on the other hand, can be actual or only a speculative deal which would be cancelled before delivery. The 15-day Brent is traded up to three months ahead of the date of loading. Thus participants can take short or long positions in the market, buying or selling cargos of forward months without physical coverage in the first instance. As the month of delivery approaches, the primary seller (a seller who actually has the oil) issues a 15-day notice of delivery to his buyer. The buyer, who may not be the end-user and who may have sold a contract to another buyer, would issue the same notice to the second buyer. The process continues until somebody takes the oil. The 15-day requirement is an important condition and each seller should issue the delivery notice before the 15-day deadline. In addition to those traders who get out of delivery obligations by passing the cargo to the next firm in the chain, some participants cancel their obligations to buy (or sell) by agreeing among themselves on a book-out before delivery notices are issued. The book-out takes place based on an agreed reference price, with a cash settlement for the difference between this reference price and the initial sales/purchase price in the contract.

The Brent market served quite a significant role in the petroleum industry during 1982-85 in two distinct regards. First, the Brent market became the industry's own futures market as opposed to other futures markets which were viewed to belong to commodity traders. Secondly, the Brent blend became an important "marker" crude the price of which was extremely important in reflecting the demand/supply conditions of crude oil. The significance of the Brent market has now somewhat declined due to: (a) revision of the U.K. tax laws in 1987; (b) acceptance and utilization of NYMEX by the oil industry to hedge or speculate about future prices; and (c) increased reliance on NYMEX prices as the market barometer. The new tax laws that took effect March 1, 1987 oblige oil companies to designate a sale within two days if they wish the transaction to count as the sale of equity oil on which the company has to pay taxes. This removes the incentive to keep on selling and buying back paper cargoes many months ahead of delivery in order to achieve the lowest possible sales price for tax purposes. In addition to the revision of tax rules, the U.K. Financial Services Act, which took effect in October 1987, imposes onerous obligations on companies engaging in "investment" business in the U.K., making Brent potentially less attractive to many speculative partici pants. The restrictions imposed by the Act would make it difficult for companies to choose their trading partners or to offer better terms to favored customers. As a result, the Brent market is becoming less attractive for traders and financial houses which participated in this market to take advantage of the flexibilities of an informal and unregulated market.

The trading volume of the Brent market increased from about 10 transactions per day in the first quarter of 1984 to about 30 transactions per day by the end of 1985. 1/ This volume dropped to about 20 transactions per day in 1987 after the revision of the U.K. tax laws. Loading of physical cargoes has been about 40-45 per month during the last three years. Thus the average number of trade per each cargo has varied between 5 to 15 depending on the level of speculative activity. The distribution of transactions between spot and forward deals changes with the volume of trade. In the Brent market, deals can vary from being for the current month to being for three or even four months ahead. An analysis of the trade volumes shows 2/ that most trade is concentrated in the category of one-month deals. Trade in two and three-month deals seems to increase when the total volume of trade increases.

Participants in the Brent market came from a population set of 125 trading entities. About 25% of these entities are continually active in the market while others trade occasionally. From the total number of participants about 35% are integrated oil companies, 5% non-integrated oil companies including investment firms. However, the striking feature of the market is the concentration of activity in the hands of a relatively small number of participants. The top ten companies account for 53% of recorded sales, the top 20 for 75% and the top 30 for 87%. The ten most active participants include five oil companies and five traders. Among the most active oil companies, BP has the highest profile while Sun, Gulf and Shell play important roles in the market. Traders frequently named were Phibro, Transworld Oil, Voest Alpine, Internorth, P&O Falco and Gatoil.

THE SINGAPORE MARKET:

Singapore's central location at the crossroads of Asia has made it the second largest petroleum port of call in the world next to Rotterdam. With about one million b/d of nominal refining capacity, Singapore is the world's third largest refining center after Rotterdam and the U.S. Gulf Coast. It has traditionally served as the "balancing" refining center for the Pacific Asian region in that it supplies consuming centers when shortages of certain products arise. As shown in Table 2.2, Singapore's refining activities

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1/ Petroleum Argus keeps detailed records of spot transactions in the Brent market as a basis for their daily and weekly reports. They distinguish between "dated" and "15-day" contracts. Their records begin in late July 1983 and continue to present. For detailed discussion, see Mabro, et al, The Market for North Sea Crude Oil, Oxford University Press, London, 1986.

2/ Marbo, et al, The Market for North Sea Crude Oil, page 198.

include: (a) conventional operations like importing and processing crude, and selling products on a term or spot basis; (b) term processing, i.e., receiving crude from national oil companies (Indonesia's Mindo, Malaysia's Petronas, China's Sinochem and the United Arab Emirates' Adnoc), processing it, and returning to them all or part of the product yields; and (c) spot processing, i.e., receiving crude from traders and returning the refined products to them.

Table 2.2: SINGAPORE PETROLEUM PROCESSING IN 1985/86
('000 b/d)

Term processing	
Indonesia (Mindo)	30-100
Malaysia (Petronas)	50-65
China (Sinochem)	80-100
UAE (Adnoc)	20
Subtotal	180-285
Spot processing	
Indonesian crude	50-75
Iranian crude	30-50
Subtotal	80-125
Other processing	340-290
Total	600-700

The outlook for Singapore is somewhat mixed. The future of its refineries is not very bright since demand for crude processing, which has long been the refineries' main activity, is less than in the early 1980s, and processing margins have been cut to the bone. In the face of increasing competition from export refineries in the Middle East, Singapore's refineries now must consider whether to build sophisticated new upgrading units and position themselves to tap the growing demand for gasoline. At the same time, the outlook for trading in Singapore looks exceptionally good. Because of its history as a major refining center, Singapore has infrastructural services to support large scale trading in oil. At present, it has over 30 oil trading companies, including: subsidiaries of major oil companies, national oil companies of OPEC countries, independent U.S. trading companies, and Japanese trading houses. These companies deal both with on-the-spot and term transactions.

Singapore is in an ideal position to take advantage of trading opportunities. With crude oil imports from all sources totaling more than 600,000 b/d in 1986 and domestic demand at just 66,000 b/d, about 90% of imports were for re-exporting. Its trading potential is particularly good in view of the following factors:

- The flow of Middle East products into the Pacific Asian market is rising. Continuing crude oil disposal problems are also pushing Asian producers such as China, Indonesia and Malaysia into products marketing. As a result, product trading in the Pacific Asian area is rising together with opportunities for Singaporean trading companies to expand their regionwide role in product balancing deals.

- The presence of almost all major world oil companies and oil trading organizations allows major decisions on product trading to be coordinated from Singapore.

- The large storage facilities of Van Ommeren and Paktank as well as refiner-owned facilities mean that large-scale product trading can take place.

- A free market economy as well as excellent telecommunications and other infrastructure make Singapore ideally suited to respond to changes in the Pacific Asian oil market.

- Implementation of the new petroleum price reporting system and possible introduction of a petroleum futures market in Singapore will provide much of the price transparency and market information needed.

As oil trading increases in the region, Singapore's trading role will be further enhanced. The emergence of new products from the Middle East flowing to Asia, Europe and, to a lesser extent, the United States, could result in fundamental realignment of crude and product prices whereby the movement of Middle Eastern products will be influenced by regional price variations resulting in much closer price linkages between the Rotterdam, Singapore and U.S. (East Coast and Gulf Coast) markets.

CHAPTER 3

SPOT-RELATED DEALS

Introduction

It is not really possible to quantify spot trading since, as indicated in the previous chapter, spot cargoes can be traded many times, leading to inflated reports of the total volume sold in this way. It is nevertheless clear that the lower spot prices of the recent past, compared with official selling prices, have attracted more buyers to the spot market: it has been estimated that up to 30-35% of oil in 1984-85 was traded on the spot. While this still leaves the greater proportion of oil trade as term business, many term trades are agreed to under conditions heavily influenced by the spot market. More and more, term transactions are struck in relation to the spot price prevailing at the time of the deal and allow for price changes during the term of the contract.

A wide variety of mechanisms are used to tie the price of oil to prevailing spot market prices, depending upon the circumstances of the buyers and sellers. Such mechanisms include countertrading and various premium and discounting schemes such as package deals, spot-related transactions and deals with favorable financial terms.

Countertrading

A countertrade is basically an exchange of oil for goods and services. These trades, with an estimated volume of about 2-2.5 million b/d, take a variety of forms, the most common being barter deals, counterfinancing arrangements and delivery of oil for past debts.

As the name implies, barter transactions include the exchange of oil for a specific set of goods and services. During 1984-86, for example, Saudi Arabia traded oil for ten Boeing airliners and Abu Dhabi received 18 French Mirage jet fighters. Iran and New Zealand exchanged oil for lambs while Algeria and Japan traded oil and vehicles. Malaysia and Brazil exchanged oil for ore and Iran and Japan exchanged oil for construction projects, and on and on.

In counterfinancing, part of the oil revenues must be used to purchase goods from the oil importing country. This arrangement is more flexible than a barter deal, by allowing the oil exporting country to choose all or part of its payment from a wide range of goods and services. Iran has entered into counterfinancing arrangements with a large number of countries including

Austria, Brazil, Greece, Pakistan, Spain, Syria, Taiwan, Turkey and Yugoslavia. Similarly, agreements between Iraq and Brazil and between Libya and South Korea require the oil exporting country to receive a certain portion of their oil revenues in the form of goods and services from the oil importing country.

Facing a squeeze on their oil revenues, some oil exporting countries have offered to pay part of their past debts in oil. These include debts to other governments as well as to private companies. Iraq, for example, has used oil to repay debts owed to France, Italy, India, and several Japanese companies. Libya has likewise repaid past debts to the U.S.S.R. and Italy.

Countertrade arrangements are not limited to the exchange of oil for other goods, but can take the form of "oil for oil." A notable example of this type of countertrade is Indonesia's term contracts to sell its crude to and buy Arab light and petroleum products from the satellite oil trading companies that market 330,000 b/d of Indonesian crude. Specifically, the arrangement called for the traders to: (a) buy Indonesian crude from Pertamina at the official price; (b) sell Arab light crude (required for Indonesian refineries) to Pertamina at the official price; and (c) sell back to Pertamina the middle distillates from the processing of Indonesian crude at official company postings, which were normally a few dollars above spot prices. This arrangement enabled Indonesia to move its oil without upsetting the OPEC price structure 1/ while effectively selling its crude at $4 to $6 below the official price.

Countertrade deals can, in theory, be attractive to both sides of the trade. Petroleum exporting countries can use them to secure a market for their oil and a supply of some critical import items such as food and military equipment; petroleum importing countries can use them to promote their exports and increase the security of their oil supplies. However, the real incentive for countertrade depends on the conditions of the petroleum market. When the oil market is tight, with spot prices higher than official prices, oil importing countries insist on countertrade both for its favorable price terms and its self-financing of foreign exchange. Under soft market conditions, on the other hand, oil exporting countries pursue countertrade arrangements to increase their oil sales by effectively cutting the price. The practice of discounting is, of course, implicit and in many instances quite complicated. The transfer price, on paper, is normally the same as the official price; but the supplier of the goods is permitted to inflate

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1/ Indonesia's incentive to adhere to the official price was not only to follow OPEC agreements but also to preserve its revenue from the sale of liquified natural gas (LNG), the price of which is linked to the official price of Indonesian crudes.

the price of his goods, thus effectively discounting the oil price. The extent of this discount depends on the difference between the official price and the spot market price since (a) the oil purchaser has the option of buying it on the spot, or, in some instances, of disposing of the oil at spot-related prices; and (b) the oil exporting country has only one option --to sell the oil on the spot or at spot-related prices.

Countertrade arrangements have not been free of undesirable consequences. Countertrade creates problems for sellers by discouraging conventional term sales and fostering the belief that ample volumes of cheaper barter crude are available. This was experienced by Nigeria in September 1985 when seven companies, six of them third party buyers and one a producer, started to phase out official-priced purchases on the ground that countertrade deals offered to other buyers resulted in much cheaper oil.

For buyers, negative consequences are primarily incurred by traders who do not intend to use the oil. Most of these problems are avoided when the purchaser is the government of an oil importing country which substitutes oil acquired through countertrade for normal supplies. However, in the majority of cases, the buyer is a private or public entity involved in the production of other goods and services, and receives the oil as payment for its goods and services. In such cases, the buying entity have problems in disposing of the oil after receiving it due to a drop in price between the time when the countertrade agreement was signed and the time the oil was delivered.

An interesting example of buyers' problems is the Voest Alpine case. Voest Alpine, the Austrian state steel company, had countertrade agreements with Nigeria and Iran to receive their oil at the prevailing official prices. To lessen the risk of a market price movement, Voest had taken short positions on Brent's forward market. The Nigerian coup and consequent review of barter policy put a stop to Nigerian countertrade in the second half of 1985. At the same time, Iraqi air attacks prevented oil exports from Iran. The delay in liftings resulted in a loss of about $65-70 million. In the meantime, short positions in the forward market were held open in expectation that oil prices would fall sharply in late November or early December. However, Austrian public discussion of this "gambling" with taxpayers' money forced Voest to liquidate the positions just as the market was peaking in November at around $30/b. If these positions had been kept open for another ten days, when prices fell by $3.50-4.00/b, they would have yielded a profit of $25 million. Held open a further three months, they would have given a profit of $120 million. The lesson from this case is that countertrade arrangements become very difficult to administer under fluctuating prices and unstable political environments.

Discounts and Premiums

Discounting or adding a premium to the official price of oil was originally a price adjustment practiced by major oil companies; they lifted the oil at the official price and sold part of it to third party customers at a discount or premium depending on market conditions. In 1977 and early 1978, when the market was weak, oil companies were forced to sell crude to contract buyers at substantial discounts off official prices. In 1979, when the market had picked up, companies started to charge premiums of about 10-20% a barrel in the form of shorter credit terms, and "service fees" of 5 to 50 cents a barrel. These premiums on oil company sales were increased to more than $8/b in a matter of months.

This practice encouraged OPEC governments to seek similar premiums in return for guaranteeing future oil supplies. Despite the statement by the OPEC president, Mr. Ali al-Otaiba, "It's the buyer who offers us much higher than OPEC prices...please don't offer us higher prices than we demand",2/ OPEC member countries actively sought premiums on their crude supply. The trend began with Nigeria and Iraq. In mid-1979 Nigeria asked its long-term contract agents to pay for half of their liftings at spot prices (giving an effective premium of $6/b); and Iraq required new contract customers to pay a $10/b premium payable in advance as a lump sum, non-refundable "signature bonus." Before the end of the year, the practice had spread to almost all OPEC members as they started to charge premiums in the form of "exploration fees," "compensation for retroactivity," etc. Even non-OPEC members followed the same strategy. BNOC adopted a surcharge of $3/b in January 1980, just a few days after it had raised its official price from $26/b to $30/b.

The trend toward higher premiums came to an end after the first quarter of 1980. It initially took the form of deductions in the amount of the premium, but by the end of 1980 premiums began to disappear altogether. In mid-1981, buyers started to ask for discounts and in response Iran cut the price of its light crude by $1/b. Other producers gradually adopted the practice, although they often disguised the discount in the form of favored credit terms, package deals, processing deals, etc.

Discounts became very prevalent in 1985-86 and played an important role in breaking OPEC's price structure. Discounts were offered by all producing countries in a variety of forms including direct (temporary) discounts, package deals, transportation and delivery allowances, and favorable financial terms. Direct discounts are, clearly, the easiest to detect.

2/ Petroleum Intelligence Weekly, October 8, 1979.

They were initially discounts off the official price; but later became discounts below the spot market price. Direct discounts also took the forms of differentials charged on nonmarket crudes which were less than those prescribed by OPEC. Package deals are more difficult to trace; both the volume of oil involved and the magnitude of the discount are often unclear. Packaging can be done in one or a combination of the following forms:

- o packaging officially priced crudes with crudes that are not priced by the OPEC conference or the equity crude that is fictitiously priced;

- o employment of incentives such as parallel lifting of specific volumes of petroleum products or condensates at low prices, taking advantage of the fact that refined products and condensates are outside the mandate of the OPEC conference; and

- o packaging crude oil with liquified petroleum gas (LPG), LNG, and petrochemical products.

. Transportation and delivery allowances are made either in the form of a direct (per barrel) freight subsidy or by absorbing the cost, indirectly, in one of the following forms:

(a) selling the crude on a cost and freight (C+F) or cost, insurance and freight basis, with fictitiously low freight and insurance rates;

(b) disposing of the crude at a terminal nearer to the buyer's refinery, thereby granting the buyer a discount on official free on board (FOB) prices; and

(c) transporting the crude to the buyer's facilities and actually paying storage fees to the buyer while the payment for the crude is made 30 days from the date of actual use by the buyer. In this case, storage is hypothetical and the fixing of the date of use is made to allow the refiner free credit and greater liquidity.

Providing a discount by granting favorable financial terms occurs quite often. The most frequent practice in this regard is to extend the credit period of the buyer to two or three months, from the normal 30 days. Other forms of favorable financial terms are interest-free or low-interest loans to buyers covering all or part of the shipment; long-term loans, extending over ten years, to finance crude shipments; and noninvoiced quantities delivered together with quantities sold at official prices, thereby effectively granting the buyer a discount.

Term Contracts with Spot Prices

The link between term contract prices and crude spot prices is either implicit or explicit. An implicit link refers to term contracts with weekly, monthly or quarterly renegotiable prices. An explicit link is established through a specific price formula, included in term contracts, which relates the contract price to Platt's spot price (monthly, fortnightly, or weekly) averages.

Implicit links have, in one form or the other, been part of term contracts since the early 1980s. Iran was the first producing country to start this practice on a large scale. In the first quarter of 1982 Iran signed several contracts with European buyers for six-to nine-month terms, under which prices were set each month on what was virtually a spot level. By May 1982, Iran offered some Japanese buyers quarterly deals at prices set ten days ahead of each quarter.

The practice of either implicit or explicit term/spot price linkages was begun in 1984 by Norway's Statoil Company. In December 1984 Statoil and its term customers agreed to settle the price of volumes lifted in each month at the end of that month, in the light of open market trends. This could be a single price, or if the spot market fluctuated widely, cargo-by-cargo pricing based on the date of nomination of loading. Seven months later, Mexico followed suit by using "market responsive" prices in its term contracts. Mexico had always adhered to its official prices, but this had cost it almost half of its market share. The market-responsive price mechanism was chosen as a way to get exports back to the target of 1.5 million b/d.

By mid-1986, spot-related term contracts became common. North Sea producers effectively abandoned the concept of setting a fixed "official" contract price. Iran was selling about 300,000 b/d to Japanese firms under so-called "frame" contract which linked prices to spot market quotations. Iraq was selling about 200,000 b/d of Basrah light crude to Japanese buyers based on average spot prices of Dubai, Oman and Arab light in equal proportions, less the freight differential. Saudi Arabia was selling products from its new refineries at spot-related prices. Other OPEC members, in particular Nigeria and Libya, were involved in similar practices. Even Canadian crudes, with twelve years' experience of state administered prices, were sold at spot-related prices. (The Canadian system is similar to that in the United States: instead of a seller's official price, there is a buyer's posted price which is kept in constant relationship with spot market prices.)

The spot-related term contracts were not without problems however. These problems arise because there is a big debate over: which markets provide the best indication of basic trends for specific crudes and products; and which source of published prices provides the most reliable information. While the debate over "which market to choose" continues, some consensus seems to be emerging. For the price of crude oil, most attention is now focused on the North Sea Brent, West Texas Intermediate and the Dubai markets. For refined products, Rotterdam is influential in gas oil and naphtha pricing, the United States is in gasoline, heating oil and low-sulphur fuel, and east of Suez in distillates and fuel oil.

The growing need for price information is prompting producers and oil companies to search for "unbiased" market indicators. This has enhanced the influence of the futures market and the spot price reporting of various print and electronic services. Reporting services being used have rapidly expanded from traditional sources such as Platt's Price Service, Petroleum Information Weekly, Petroleum Argus and Oil Buyer's Guide to include a host of others like Reuters, Tolerate, Petroflash, Oil Market Trends and the industry-sponsored Asian Petroleum Price Index . To minimize the risk of manipulation, some deals rely on a basket of quotes from various published sources and are tied to spot price quotes over a number of days before and after loading or arrival. Price information pitfalls are most pronounced for the secondary crudes and products not actively traded every day. In the absence of adequate data, selling prices are usually calculated from the best comparable market, with an agreed link or index to another oil or location.

TENDERS:

Short term tenders for the purchase and sale of crude oil and refined products are an increasingly popular adjunct to spot-related prices, both in industrialized and developing countries. The U.S. Government buys roughly 550,000 b/d on tender for use domestically and overseas (for civilian and military needs), plus 35,000 b/d (in fiscal year 1986) for the Strategic Petroleum Reserve. Other countries like Japan also purchase stockpile oil, running about 50,000 b/d through tender offers. In the developing world, there are numerous cases of oil tendering, as in India, Taiwan, Thailand, Bangladesh, Tanzania, Madagascar, etc. The buying policy of the Ceylon Petroleum Company of Sri Lanka is a good example. While retaining term contracts with Saudi Arabia, Iraq and Malaysia, Ceylon buys around 20,000 b/d of crude, around 60% of its total requirements, through tender offers. It also tenders for all its product sales or purchases, inviting 20 to 30 selected oil companies and traders to offer crude oil about once every six weeks.

Netback Pricing Contracts

Netback pricing of term contracts was first practiced by Libya and Iran in the early 1980s for limited volumes of sales and limited periods of time. In 1986, netback pricing became much more significant because: (a) for a limited period of time, it replaced OPEC's official pricing scheme; (b) it provided the oil producing countries with a price-war weapon; and (c) it may return whenever oil producing countries disagree on a coordinated production and pricing policy. It is therefore very useful to analyze the consequences of the 1986 netback pricing experience and to assess the impact it has had on market participants within and outside OPEC.

In 1982, when the market started its downward trend, Saudi Arabia, which felt somewhat responsible for flooding the market during the 1979-81 period, voluntarily reduced its level of production from 9.9 to 6.5 million b/d. In March 1983, it accepted an implicit production quota of 5 million b/d 3/ and, more importantly, proclaimed itself OPEC's swing producer. In this latter role, Saudi Arabia was forced to reduce its output to about 2.3 million b/d by the third quarter of 1985. Unhappy with its less powerful position in OPEC, Saudi Arabia announced in July 1985 that it was abandoning the role of swing producer and would try to boost production to a minimum target of 3.5 million b/d. Saudi officials realized that customers would only be attracted by market responsive prices, and considered three options on which to base their sales price: the Arab Light spot price, the spot prices of other crudes; or the spot prices of refined products. The relatively small amount of Arab Light traded on spot made contracts linked to its spot price unattractive. Among the other crudes, it considered North Sea Brent (Saudi Arabia does not view West Texas Intermediate as an international crude), but this would have meant linking production and pricing policies to a very volatile spot market. Netback value pricing was therefore chosen by a process of elimination.

Saudi Arabia's drive to recapture market share through netback deals was quite successful, and large segments of lost markets in the Atlantic basin and east of Suez were won back. By the first quarter of 1986, its output increased to about 4.5 million b/d, even though it was more interested in consolidating sales to established customers than in dramatically raising exports. This was done by converting existing Petromin contracts at official prices into new netback deals. Most Saudi customers, such as BP, Elf, CFP and Neste, as well as Taiwan's CPC and South Korea, switched from

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3/ The Saudi Arabian production quota was adjusted to 4.35 million b/d in 1984.

Petromin term contracts to netback deals. The table below contains estimates of Saudi Arabia's netback contracts in early 1986.

Table 3.1: SAUDI ARABIA'S NETBACK CONTRACTS IN 1986
('000 b/d)

Western Destinations					
Majors West	1,070	Europe	425	Americas	235
Exxon	340	Motor Oil Hellas	125	Petrobras	75
Texaco	200	Neste	50	Champlin	60
Mobil	180	Garrone	50	Ashland	50
Chevron	100	Saras	50	Marathon	50
Shell	100	Cepsa	50		
BP	100	Enpetrol	50		
CFP/Elf	50	Turkey	50	Subtotal West	1,730
Eastern Destinations					
Majors East	450	Other East	230	Japan	220
Caltex	250	Bahrain	100	Mitsubishi	100
Mobil	100	Taiwan	60	Kyodo	70
Exxon	100	South Korea	50	Marubeni	50
		Pakistan	20-35		
				Subtotal East	900
				Total	2,630

Source: Petroleum Intelligence Weekly, February 10, 1986.

Calculation of Netbacks

Calculation of a netback value is aimed at deriving a value for crude oil by deducting from the revenue obtainable from selling the refined products the costs of refining and transportation. Since product prices and the yield pattern of refined products vary between crudes and between markets, the calculation needs to be specific to crude and to refinery location.

Figure 3.1 illustrates the concept and the computation mechanism of netback value. The physical movement of oil is from port of loading to the ship; from ship to the refinery; and from refinery to market. Netback value computation follows the same steps in reverse order, as follows:

- First, compute the weighted average value of the refined product obtainable from a barrel of crude oil at the refinery gate. This is known as the gross product worth (GPW) of the crude. It is calculated by multiplying the prevailing spot price for each product by its percentage share in the yield of one barrel of crude oil.

- Then, deduct from GPW the cost of refining, which consists of the out-of-pocket operating expenses involved in the handling of the last barrel of crude by a refiner to arrive at the net product worth (NPW) of the crude. Since we are considering the marginal barrel, this does not include any amortization or depreciation.

- Finally, deduct from NPW the cost of transportation and insurance to arrive at the netback value of crude at the port of loading. The transport cost is the cost of chartering an appropriately sized tanker on the spot market for a single voyage.

The logic of calculating the netback value at the port of loading should now be clear. By subtracting refining and freight costs, spot product prices are translated into an equivalent crude oil value at the loading port--the so-called "FOB netback". Thus, if the price of crude is supposed to be determined by the netback value, the logical choice would be to relate the FOB price of the crude to the FOB netback value at the port of loading.

There are a few points worth noting in the netback calculation procedure. First, the most important information in this calculation is the refinery yield, i.e., the mix of products obtained from a barrel of crude oil. This mix varies not only with the quality of each crude, but also with the pattern of local market crudes--which can shift from winter to summer--and with the technical capabilities of individual refineries. Thus, looking for specific yield patterns would mean compiling thousands of mixes corresponding with various crudes, various refineries, and different periods of time. Recognizing the impossibility of such a task, Petroleum Intelligence Weekly has developed data on crude oil yield patterns that are "typical" or "representative" of the refining industry in each of the six major refining centers. The yield estimates for 1986 are given in Appendix A.

Second, the refining cost, used in netback value calculations, does not include capital costs. The implication is that netback value is purely a marginal phenomenon corresponding with the short-term operation of a refinery. Thus, netback value is not intended to provide a basis for long-term development and resource management.

Saudi Arabia's netback pricing contracts followed the general concept described above but, instead of limiting the refining cost to "out-of-pocket" operational expenses, Saudi contracts allowed for some ($1.50-2.00/b) capital cost. Thus, the total refining (operational and capital) cost could be as high as $2.00-2.50/b.

As to the mechanics of the trade, the buyer was responsible for refining the crude. Product prices were based on the average (between the date of loading and date of discharge) of Platt's price series corresponding to the location of the refinery where the buyer would run the crude. In the soft markets of mid-1986, purchasers insisted on paying according to the spot prices of the latest possible date. Some contracts were based on spot prices of five or ten days around the date of discharge or relatively long periods (25 days) after the date of loading. And the freight and insurance allowance was based on actual costs for each cargo.

Saudi netback contracts with the Far East were in some respects different from those with the West. First, pricing was based on an average of product prices around the date of lifting, while contracts for Western destinations were linked to prices at the time of discharge. Second, Far East deals were based on Rotterdam prices, due to thin trading in local spot markets, with freight deducted from Ras Tanura. An extra 60 cents a barrel was then charged to compensate for the lower freight costs that prevail to the East as well as historically higher prices there. Third, fuel oil yields in the contracts with Japan were less than those in contracts with the U.S. oil companies, although the average fuel oil yield in Japan was much higher than in the States.

Saudi netback contract provisions set an example for other producers to follow. In January 1986, Nigeria signed netback contracts with its equity partners, guaranteeing them a minimum $2 a barrel margin on their own share of crude and $1 a barrel on government oil. These contract arrangements were similar to Saudi netback sales with one important difference: the Nigerian price was based on an average of published product prices in the calendar month in which each crude cargo was lifted. Saudi contracts were based on the average price around the date of discharge. In the Nigerian contract, the refining cost allowance was $1.80 for the U.S. Gulf Coast, $1.30 for Northwest Europe, $1.20 for the Mediterranean, and $1.00 per barrel for the Caribbean.

Iran's netback contracts were also similar in structure to Saudi Arabia's, with an additional feature, a floor and ceiling mechanism. A formula tied to spot crude prices defined the limits within which netback pricing applied. If the netback value went above or below these limits, the spot crude formula was used instead. Thus, if netback values fluctuated too

widely out of line with the spot crude market, they were disregarded, protecting both buyer and seller. The spot crude formula was based on an average of Brent and Dubai prices with the "floor" about $2 below and the "ceiling" about $1 above.

Consequences of Netback Deals

Netback pricing transfers the market risk from downstream operations to the producer. It also transmits a price signal from the heart of the market to the producer.

The risk transfer role is valued very highly by oil companies. In a falling market, oil companies can incur substantial losses from price declines between the date they buy the crude at the loading port and the date they sell the refined products manufactured from that crude. They are therefore interested in avoiding as much of this risk as possible. Some oil companies have started to use the futures market for this purpose. They could sell short on the futures market around the same date that they buy the oil at the loading port, liquidating the position around the time they are selling the products. The futures market, however, does not provide a complete protection since it only covers one crude (WTI), two products (gasoline and heating oil), and only three locations (Oklahoma, New York Harbor and Rotterdam).

Netback contracts with a pricing date close to the date of selling the products provide a more convenient way of transferring risk. An even better arrangement in this regard would be the so-called "realization" contracts under which the producer sells crude at realized product prices.

The second function of netback pricing, i.e., transmission of price signals, is more neutral. It does not favor either side of the trade but helps both sides to arrive at a common understanding of market conditions. Finding relevant price signals has always been a potential area of dispute between producers and oil companies; netback pricing provides a vehicle for the automatic transmission of price signals.

Serving the above two functions, netback deals should not, in theory, cause any significant change in the structure of the market. However, in practice, these deals have important consequences for Saudi Arabia, for OPEC, and for the world oil market.

To Saudi Arabia, the advantages of netback deals over sale at crude spot prices were more stable price patterns and more reliance on integrated oil companies rather than on traders. On the other hand, these transactions had some severe drawbacks for Saudi Arabia compared with official sales and

crude spot sales. the most important disadvantage was a potential loss of revenue since netback values tended to be lower than spot and official prices of crude oil; the agreed yields tended to favor buyers; and the refining costs were somewhat excessive.

The reason that crude spot prices stay above the netback value is that the average value of crude to refiners in each market is above the netback. The spot crude price is an indicator, produced by the market, of the average value of a crude; the netback value is an indicator, worked out by the industry specialists, of its marginal value. The negative margin between the netback value and the spot price has persisted for the last eight years. However, it does not mean that refiners have been consistently bearing losses. Thus, the netback contracts caused Saudi Arabia to take a loss by selling at netback rather than at spot prices, and the loss was exacerbated by including in the refining cost an allowance for capital costs which reduced the price paid for its crude to a level below normal industry estimates of its netback value.

Added to the above areas of potential loss to Saudi Arabia was the refinery yield, or mix of product output, included in Saudi netback contracts. The contracts with U.S. oil companies were based on approximately 40% gasoline, 20% distillates, 30% fuel oil and 10% other (LPG and refinery losses). The fuel oil percentage was crucial. Allowance for 30% fuel oil in the netback contract with some sophisticated refineries which normally produce less than 10% fuel oil would in effect discount the value of crude by about 5%.4/ In short, netback contracts had their drawbacks for Saudi Arabia. They undervalued the crude by pricing it at its marginal rather than its average value, by allowing additional refining costs, and by allowing a high proportion of residual fuel oil in the notional slate. In return for the loss of revenue, netback contracts ensured the attractiveness of Saudi crude at a time of oversupply and re-established Saudi Arabia in the international petroleum market.

Also, by virtue of their provisions, netback pricing deals encouraged oil companies to increase throughputs and sales of products on the spot market. As explained previously, netback contracts cover all operating and some capital costs. Thus, as long as a refiner has excess capacity he will gain from increasing his utilization rate. Furthermore, by basing the netback on product spot prices around the time of product sale, refiners run a low business risk and will have little concern about market conditions at the

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4/ Residual fuel is priced on average at 70-80% of the average prices of No. 2 heating oil and regular gasoline. A shift from 30% to 10% fuel oil would amount to a 4-6% increase in the GPW of the crude.

time of sale. This will further prompt an expanded throughput. Aggregating this behavior over all the oil companies results in increased demand for OPEC oil and flooding of the product spot markets with direct or indirect sales of the additional refinery throughputs, as was actually observed in 1986 when netback pricing became commonplace and the netback value as well as the spot price of crude oil dropped below $10/b.

CHAPTER 4

THE ROLE OF PETROLEUM SPOT PRICES

Sources of Information

All trading needs market information, or striking a bargain with any confidence becomes impossible. In petroleum trading this information is provided through business contacts to which can be added information put out by such services as Platt's Oilgram, Oil Buyers' Guide, Petroleum Argus, Petroleum Intelligence Weekly, and some other sources.

Platt's Oilgram was founded in the 1920s to report on prices in Texas and in the US Gulf Coast. In the 1960s Platt's began a European price series which was, in 1966, converted to the current Rotterdam price information. In 1970 Petroleum Argus started in London and, more recently, the daily price information is made available through: international press agencies, Reuters and AP/Dow Jones; Petroflash which was initially established as a joint venture by PIW and Oil Buyers' Guide but acquired by McGraw Hill, the publisher of Platt's in 1985.

All these prices share certain properties: they are based on regular trawling of market information, but not on a comprehensive formal survey or even a representative sampling of actual price quotations. Platt's, which is the most influential source of price data, has developed a network of contacts--traders, brokers and refiners (all of them deemed to be active in the trade)--from which information on the spot market is collected daily. From this information, Platt's staff daily prepare what they call an "assessment" of spot prices. The quotations are not reports of the extreme limits but are assessments of the day's prices for "typical" or "generally available" products. These assessments, unavoidably, contain some subjective elements. The subjectivity surfaces in a number of ways. For example, the spot price series tend to lag behind large price changes in the market. Assessors are reluctant to validate large price changes, even when the statistical average of reports would encourage them to do so. Instead, prices are increased in small shifts as the trading community's reaction is tested out. Nevertheless, the information is considered useful. It complements the traders' judgement of market conditions. As one expert describes it, "The process of collecting scraps of information and piecing together an impression of the whole is exactly what any trader does himself when evaluating the market. A (Platt's) journalist may have a better chance

of putting together an accurate picture, since he can cast his net more widely".1/

Uses of Spot Prices

Use of spot prices reported by agencies such as Platt's is much wider than might be expected. The primary areas of use are:

- o product term contracts with variable pricing clause;
- o crude oil sales based on spot crude or product prices;
- o management of refining/marketing activity;
- o adjustments in refineries' posted prices;
- o government retail price controls linked to spot product prices.

There are two ways by which product term contracts between refiners and marketers are normally related to the spot price. Either there is an explicit linking by including a formula which automatically changes the contract price as spot prices vary; or there is a de facto linking by including a periodic price review clause, which would normally provide for monthly or quarterly renegotiation of the price based on the spot market trends. Both of these arrangements may result in contract prices which somewhat lag behind the spot price; but the influence of the spot price would, in any event, remain substantial

Crude oil sales based on spot prices are of more recent origin. They take the form of:

- o term contracts with an automatic price adjustment;
- o term contracts with a monthly or quarterly renegotiation clause;
- o netback value contracts;
- o realization deals.

These arrangements have been discussed in Chapter 3.

1/ Roeber, J., "The Rotterdam Oil Market", Petroleum Economist, April 1979.

The use of product spot prices in management of refining/marketing activity is a product of recent market conditions. For several years refiners in the USA, Japan and Western Europe have been plagued by overcapacity. Poor operational economies stemming from low capacity utilization coupled with marginally refined and therefore cheap surplus products available on the spot market have meant that some refining/marketing companies have had to consider the possibility of cutting back on running crude themselves, and instead buying products manufactured by others. Spot prices are studied closely to decide how much of their needs these companies should produce through their own refineries and how much they should purchase on the spot market.

The use of product spot prices in setting "posted prices" is becoming a normal practice. The posted price is an official selling price set by refiners. Posted prices have traditionally lagged behind product spot prices, which may imply that there is no strong link between posted and spot prices. The catch, however, is that posted prices are not necessarily the prices at which trade occurs. They serve as a reference point for negotiations and, depending on the market conditions, there will always be premiums and discounts. These premiums and discounts, on the other hand, take account of the prevailing difference between the posted and spot prices, effectively changing the purchase price according to the spot price.

In the USA, posting include also the price at which refiners buy their crude oil. These prices are nowadays revised quite frequently. PIW presents an analysis of the correlation between crude posted and spot prices in the USA.2/ It concludes that US independents (like Koch, Permian, or Diamond Shamrock) are aggressively market oriented, and the mini-majors (such as Sun, Conoco and Marathon) are not far behind. However, major oil companies (like Exxon, Shell, Amoco and Mobil) change postings much less frequently than the smaller firms, but are still much more market responsive than they were in the past.

The use of spot prices in government retail price controls emerges from: (a) the need to regulate domestic prices; (b) the need to set a reference point for internal price transfers of integrated oil companies; and (c) the lack of any other measure which could be used for these purposes.

As a result, most European countries have worked out quite complex formulae to relate price maxima and minima to Platt's prices.

2/ Petroleum Intelligence Weekly, May 13, 1985.

Most Frequent Complaints Against Spot Prices: Political and Technical

Complaints against spot prices are of two types: political and technical. Political objections are normally raised when spot prices are moving against the interest of a group. The use of spot prices to support political objectives is clearly demonstrated by the periodic shifts of the position and attitudes of consuming governments and OPEC members towards the legitimacy of spot markets. During the slack years (1974-78), governments of consuming countries used low spot prices as a lever against OPEC price increases and as a medium to limit majors' domestic prices. OPEC was then playing down spot prices, denouncing their reliability, accuracy and representatives. In 1979 consuming governments and OPEC switched positions on the validity of spot prices. OPEC used high spot prices, either explicitly or implicitly, to raise its contract prices. Consuming governments, on the other hand, denounced spot prices as "no longer an indication of overall commercial oil value"3/ and embarked upon various studies to limit the activity of the spot market. As the market conditions reversed in recent years, consuming nations have again discovered that spot prices represent the true value of oil, while OPEC blames spot prices for the present instability of the petroleum market.

Technical objections to spot prices are more systematic and worth noting. The most frequent complaints are: (a) the lack of an organized trading floor; (b) the thinness of trading; and (c) the inefficient assessment of spot prices.

LACK OF AN ORGANIZED TRADING FLOOR:

A point often made about spot prices is that, without a formal trading floor, information on spot prices is necessarily incomplete and unreliable. As spot trading does not take place on an organized exchange or trading floor, there is no location at which all the deals are made, no registration of membership, no official reporting of trans actions (price and volume), and no formal administrative body. Instead, deals are individually registered between agents who can be anywhere. Much of the assessment of these deals is made through Platt's editors' telephone calls to selected trading contacts. Therefore, the market information is not and cannot be collected within a solid and systematic framework. This is a generally accepted problem in the transparency of present spot prices. However, the source of the problem is not in Platt's price reporting system, but with the structure of the spot market.

3/ See European Commission's press release in Petroleum Intelligence Weekly, September 14, 1979.

THIN TRADING:

Thin trading and lack of adequate and continuous supply have occasionally been cited as fundamental problems with spot prices in general, and with Platt's assessments in particular. If Platt's can discover no deal to report then it repeats the previous day's price. For some products in certain markets it is not uncommon to have gaps of up to several weeks between publicly reported deals. Thus, when Platt's can again report a firm price it may well bear little relation to the one that has been continually restated over the preceding weeks. A prominent example of this is the 1985-86 trend of Arab Light's spot price. Platt's assessment of the Arab Light spot price remained at $27.00 during the collapse of the oil market (November 1985-February 1986) when the price of WTI and Brent plummeted from around $30 to $15 per barrel.

Oil companies have, during slack periods, extended the thin trading argument to say that the spot market is, in general, too thin and limited in actual supplies to provide a basis for pricing of petroleum products in retail markets. This is, in nature, a more fundamental criticism than the reporting problem discussed above. However, this complaint indicates a lack of under standing of the role of the spot market. By definition, spot prices are predicated upon marginal transactions; and significant volumes need not be behind such prices. At any point in time, incremental additions to or disposals of one's oil stocks via spot purchases or sales will have different values to different parties. Spot purchases will always be made by the buyer who places the highest value on incremental supplies. Similarly, spot sales will always be made by the seller who least values his excess supplies. Consequently spot prices show the equilibrium point of the marginal values of oil to the seller and buyer. These prices will almost always be different from the average market prices. What oil companies are pointing out is that the marginal price should not be replacing the average price, which is presumably related to the cost of refining and marketing the oil.

SUBJECTIVITY OF PLATT'S PRICE ASSESSMENTS:

Objections to Platt's methodology are primarily concerned with the subjectivity of its price assessments. Platt's subjectivity is to be expected. Such private endeavors often lack a comprehensive database, and what is missing in statistical data must be filled in by the assessor's intuition about the market. Platt's makes no pretensions about this point. It emphasizes that its prices are assessments of market conditions. Nevertheless, the subjectivity in performing these assessments poses problems. For one, no two individuals are ever likely to judge the market precisely the

same. How big a problem this subjectivity of assessment is depends on the ways and means of using these prices. The traditional role of Platt's prices, i.e., to provide a feel of the market, is not severely jeopardized by subjective assessments. In fact, some defendants of Platt's argue that its assessment is more useful than a huge volume of hourly fluctuating numbers which would be provided by a "more objective" statistical compilation of data. But the main objections to the subjectivity issue arise when Platt's prices are used as actual market prices in areas such as government price regulations and contract price arrangements, for which Platt's was not initially designed.

Is There an Alternative?

Whenever so much hinges upon a set of numbers, the accuracy of which is subject to question, all ways of improving them are likely to be explored. The efforts in this direction have intensified since the mid-1970s and fall into the following general categories.

- o development of registration/monitoring system;
- o introduction of spot price indices;
- o creation of a formal trading floor;
- o introduction of futures markets.

REGISTER/MONITORING SYSTEMS:

Complaints about the inaccuracy and unrepresentativeness of spot prices are to some extent related to the self-interest of those raising them, but to a larger extent reflect concerns about the problems inherent in the structure of the spot market and the nature of the reporting systems. To evaluate these complaints, the European Commission set up a six month price monitoring system (Check-Run) in 1978 followed by another one (Comma) in 1979-80.

The purpose of Check-Run was to verify published spot quotations--in particular those of Platt's Oilgram Price Service--and cross check with the actual spot price. Thirty three companies and a number of traders participated. From the seven products traded on the spot market (premium and regular gasoline, naphtha, jet kerosene, gas oil, low and high sulphur fuel oil), all but jet kerosene were included in Check-Run. Spot transactions by participants in these products were registered weekly with the auditors for their specified reporting area. Reporting areas were divided as follows: barge trade through the ARA (Amsterdam-Rotterdam-Antwerp); cargo trade

through the ARA ports, Hamburg-Bremen, French Atlantic coast, and the UK east and south coasts. Among twelve Rotterdam price series examined (six petroleum products in barge and cargo markets), three did not generate sufficient volumes of trade to support regular let along daily price reports. These were regular grade petrol in barges and cargoes, and naphtha in barges. Another three products (premium petrol, low sulphur and high sulphur fuel oil cargoes) had sizeable markets but did not generate sufficient reports to make comparisons useful. Of those prices which could be compared, the Check-Run concluded that only three products (naphtha cargoes, gas oil cargoes, and low sulphur fuel barges) were accurately reported.

In early 1979 the European Commission's concern about the effects that exceptionally high prices on the Rotterdam market had on worldwide oil costs led the Commission to reintroduce the register of spot transactions. Comma, the second effort to register spot prices, was carried out with the purpose of understanding the structure and operation of the spot market. The results of this new exercise were more favorable to the Platt's price reporting procedure, indicating that there was no easily implementable program to improve the present system. Specifically, the group concluded:

- o There is not enough justification to maintain a price reporting system on a permanent basis.

- o The ability to reintroduce the register should be maintained on a stand-by basis. This would be done in such a way that it could be quickly introduced at times of artificial disruption of the supply/demand balance.

In short, it is easier to raise objections to the reporting and the role of spot prices than it is to do something about the system. Indeed, Platt's has not sought the burdensome role it now holds. Rather, governments, oil companies and traders have come to it, each seeking some independent barometer of market conditions for its own reasons. Clearly, all the users realize that Platt's prices should not be utilized as statistical inputs into government regulations, contract arrangements and the like; but they justify their use primarily by the lack of any alternative.

INTRODUCTION OF SPOT PRICE INDICES:

Efforts to introduce spot price indices are of more recent origin. In May 1985 the International Petroleum Exchange of London launched a daily market index for Brent crude. This index appears at noon London time with an average price for 15 day cargo supplies as reported the previous day. These are spot cargoes deliverable at 15 days' notice in the month ahead at sellers' option. The index is an average of Petroflash, Argus and London

Oil Reports. Platt's declined to be used unless it was the exclusive source.

A much more extensive effort to prepare price indices (with some common features with monitoring systems) has been launched in the growing east of Suez spot markets. A number of oil traders, refiners and state oil refiners agreed in April 1985 to collect price data on refined products in Singapore and Japan. The price gathering effort, known as Asian Petroleum Price Index (APPI), involves seven refined products in Singapore, and four products on a delivered Japan basis. Participants submit price data weekly to an accountant for collating in accordance with an established formula. The resulting indices are telexed back to the paid subscribers. This industry participation scheme was developed by a trading company, Seapac Services, which is the administrator of the plan. Seapac Services appoints a panel, composed of producers, traders and refiners actively engaged in the Asian markets, which is to submit price data. Seapac also has the responsibility to keep the group "balanced".

The idea of Asian petroleum price indexing was then extended to the Asian crude markets. The Asian crude oil index monitors 14 representatives crudes, including the most important Indonesian, Malaysian, Australian, Chinese and Middle Eastern crudes. The crude price index is designed to serve a necessary role of price reference in crude supply contracts as well as spot transactions. However, some traders view the market to be moving too fast to make these weekly assessments useful.

CREATION OF A PETROLEUM "BOURSE":

The idea of an organized bourse for petroleum spot trading was proposed by France in early 1979 in the hope that it could control galloping prices on the spot market and ensure that quotations were authentic and not manipulated. The feasibility of implementing the idea was then explored by the European Community in 1979-80. The proposed scenario envisaged:

- Compulsory participation by all "entities" in oil trading in the EC;
- automatic registration of all spot transactions;
- exclusive computer access to the "exchange" by registered entities.

The proposal was examined by a group of experts from different parts of the oil industry, who reached the following conclusions.

- o A market in the sense of an effective trading mechanism already existed. It differed from an official bourse in that there was no registration of membership, no official registration or reporting of transactions, no formal administrative body, and no physical trading floor. But the existence of modern telecommunication systems rendered the physical centralization of trading unnecessary.

- o The establishment of a formalized bourse for oil trading did not seem to be practical. Establishment of such a bourse would not significantly improve the way in which spot trade was handled.

- o The initiative of the London Commodity Exchange in establishing a market in oil product futures should be recalled and followed carefully.

INTRODUCTION OF FUTURE MARKETS:

We have in this chapter, thus far, reviewed the way spot prices are assessed, the transparency and accuracy problems of these prices, and the efforts of governments to develop alternatives. We have found out that, while the industry and government authorities feel substantial discomfort with these prices, most efforts to develop alternatives have ended in disappointment. It is somewhat unfortunate that the petroleum industry had to repeat the unsuccessful experiences of similar efforts in many other commodity markets just to find out that they did not work. However, the fortunate fact is that the experience from other commodity markets also provides some clear guidance about what arrangements would work.

Spot trading is in the true meaning of the word a free market phenomenon. Its information needs cannot be met by any controlled or even monitored arrangement. When the information need becomes strong enough, it will, through the market mechanism, develop its own answer; and the "natural" answer to a need for price transparency is the futures market. Inception of a futures market should not be undertaken by public authorities. It is simply a matter of demand and supply for price information. When there is enough demand, the market will prompt a profitability signal and entrepreneurs will respond by creating a futures exchange.

Trading in futures markets takes place on a physical floor with deals struck by the method of open outcry and is thus quite different from the workings of spot and term business. Open outcry means that those allowed to trade on the floor of the market face each other in a ring and bids and offers are shouted aloud until a match is made. All are thus aware of every business opportunity. This information is made fully available to interested parties

outside the market via visual display unit systems and is systematically reported by the financial and trade press.

The suitability of futures prices to take the leading role in price referencing is evidenced by the rapid penetration of the New York Mercantile Exchange (NYMEX) and the International Petroleum Exchange (IPE) oil futures prices in petroleum trading decisions in the USA and Europe respectively. Indeed, NYMEX prices have practically taken over, for the crude and products traded on this exchange, the function of price referencing in the USA. The chart below shows the correlation between the prices of nearby (the next immediate month) futures and the spot market for the crude oil (WTI) traded on NYMEX. The correlation between the two price patterns is very strong (the correlation coefficient is above 99 per cent). This is because spot prices nowadays simply follow the futures market. Most people acknowledge in New York, Houston, and increasingly in other parts of the USA that there is little spot market trading that takes place until NYMEX actually opens in the morning.

In addition to the price referencing function in spot trading, futures prices are increasingly used in setting the contract or posted prices. For example, Exxon used to adjust its heating oil postings in the New York Harbor once a week, late on Friday afternoons. Now it changes postings almost daily using the NYMEX heating oil futures price as a reference point. Another example is Conoco which uses futures prices as a component in its formula to establish posted prices.

There are three serious limitations to the usefulness of the existing futures market as a source of reference prices which would be valid worldwide.

- Problem of location - NYMEX contracts represent only one segment of the market, a specific US grade delivered in a specific US location. This limits their usefulness to traders in Europe or the Far East. The solution to this problem is the creation of futures markets in other important trading centers. It is very likely that NYMEX and the International Petroleum Exchange of London be linked in the near future, providing some facilities in this regard.

- Problem of products - NYMEX product contracts are only for regular gasoline (leaded and unleaded)and heating oil, and there is no reference price for other products. This is especially a problem with regard to heavy fuel oil, the price of which does not seem to correlate with the products traded on NYMEX.

- Problem of quality and grades - NYMEX contracts are for specific grades of crude oil and petroleum products. Thus NYMEX prices cannot be readily used as reference for other grades and qualities. This is not as severe a problem as the first two. The oil trade is developing rules of thumb to arrive at some price differentials which are used as "quality basis" to convert NYMEX prices into prices of other crudes and product qualities.

Emergence of New Marker Crudes

In the past, Saudi or Arab Light crude was the marker crude against which values of lower or higher quality oils could be set. This concept was developed twelve years ago when Arab Light crude emerged as price leader on the strength of its high volume (6.5 mmb/d in 1977) and its similarity to other OPEC crudes inside and outside the Gulf. Although Saudi Light is still OPEC's de facto marker crude, it is no longer viewed in the industry as a "free" crude and its price movements do not carry as much prominence as in the past. Instead, the West Texas Intermediate (WTI) of the USA, the UK's Brent Blend, and Dubai's Fateh crude have become the new commercial marker crudes as their prices reflect market conditions more realistically.

The chart below shows the spot prices of Arab Light, WTI, Brent Blend and Fateh crudes during the period July 1985-March 1986. The problem with Arab Light is that its spot price does not follow market patterns and indeed has stayed relatively stable through the recent violent fluctuations in prices of other crudes. Further, the perception today is that Arab Light is not spot traded in any significant volume, and the spot price quoted is nothing more than the repetition of previous prices. While production of Arab Light (about 1.5 mm b/d) is still higher than that of UK Brent (750,000 b/d), spot trading of Arab Light is very small. In addition, WTI and Brent are extensively (up to 30 mm b/d) traded on the futures and forward markets.

WTI is now becoming central to world oil market prices. Highly visible price quotas on NYMEX account for much of this phenomenon. Technically speaking, WTI is an unlikely world market indicator since physical supplies are largely landlocked in the USA mid-continent pipeline system and are non-exportable. WTI prices reflect US buyer thinking, but often do not match precisely with landed prices of imported crudes due to differences in trading practices. For example, WTI trades in minimum parcels of 10,000 to 50,000 barrels a month, with a few deals in the range of 150,000 to 300,000 barrels a month. This compares with typical world market crude cargoes of 600,000 to 1.8 mm barrels.

The central delivery location for WTI is in Cushing, Oklahoma, where several large pipelines with about 1 mm b/d converge. Some supplies are also

routinely exchanged for similar domestic oils further south, near the big Texas coastal refining centers. WTI is gathered over a wide area both by truck and small pipelines, converging in the Midland, Texas, area where it is either routed north to Cushing (thence to the inland Chicago and Upper Midwestern refineries) or to the Texas refineries. In addition to Texas crudes, Cushing is a center for the Oklahoma gathering system with its 20 mm barrels of storage capacity.

Brent's elevation to the status of marker crude is primarily due to the substantial sales of this crude in the physical market and, more importantly, to enormous volumes of speculative trading on the forward market.4/ In addition, the recent move to abolish the state oil trading company, British National Oil Corporation (BNOC), has further exposed the Brent to market fluctuations. The Brent spot price is now widely monitored and is often used as a yardstick by other producers, especially those in West Africa and the Mediterranean. The emphasis of Brent trading is, however, shifting towards hedging--with traders and refiners buying or selling forward increasing volumes of Brent to cover their future sales or purchases of Mideast, African, and even other North Sea grades. The forward Brent market provides an effective hedging tool because of its liquidity and price quotes up to six months forward. European refiners often prefer this forward market to the futures market because they can cover large quantities without making waves on the market. Also, because of its large size deals and the unstable prices, the Brent spot market is becoming concentrated in the hands of some major traders including integrated oil companies, large New York investment banks and Japanese trading houses.

Dubai's Fateh Crude--sometimes called the "Brent of the East"--has now turned into the primary spot crude of the Persian Gulf. Also, forward sales have become an established element of the market for this crude. Fateh is viewed as a free crude because:

- its output is free of OPEC limits;
- its production (350,000 b/d) is sold by several firms rather than a single company; and
- its quality is similar to Arab Light.

The market for Fateh crude, however, differs from that of Brent in that:

4/ A forward contract is an agreement for the sale (or purchase) of a commodity at a specified time in the future at a certain price.

- o forward trading is confined to one or two months ahead as compared with Brent's four to six months;

- o most participants intend to obtain physical delivery and do not move in and out of paper barrel positions as with North Sea oil; and

- o price differentials on forward months tend to be smaller than those in the Brent market.

Finally, in the Mediterranean, Libya's lighter Es Sider grade is developing into something of a regional reference crude due primarily to barter deals and the diversity of its suppliers. Forward deals are limited to two months, often resulting from barter volumes being sold in advance, rather than speculative interest. In spite of its significant output of about 400,000 b/d, the influence of Es Sider is kept fairly local since it cannot by US law move to the large US market where light sweet crudes presently enjoy premium values.

CHAPTER 5

THE MECHANICS OF FUTURES TRADING

Petroleum futures markets have, in the last five years, grown very rapidly, with a profound impact on spot trading. It has now become a common practice in the USA not to transact a spot trade before considering the NYMEX futures prices.

Petroleum futures were, until four years ago, dismissed by many industry analysts as of no significance in the oil business. Today, most people accept that petroleum futures are here to stay; but there is still controversy over how important a role futures will play. Some analysts view oil futures as a "paper market" with no significant relationship to the real market. Others argue that oil futures not only will turn into "something big", but will change the structure of the petroleum market considerably. This controversy is due partly to differences of opinion with regard to the structure of the petroleum market and partly to widespread confusion about the working of the futures market and the manner which it interacts with the spot market. This chapter provides description of the mechanism of futures trading.

How Futures Trading Works

Let us assume that a distributor is holding 100,000 barrels of heating oil for delivery to his customers in December. He is committed to supply the heating oil at the spot market price at the time of delivery. The petroleum market is unstable and he fears that the price of petroleum products (including heating oil) may decline substantially by the time of delivery. A change in the price of heating oil from 60 cents per gallon to 55 cents per gallon would leave him with a loss of $210,000. Thus, a decision to keep his inventory would be very risky. A clear alternative is to sell the inventory on the spot market and acquire it back before the month for which he has a delivery commitment.

A much more convenient alternative for the distributor is to keep his stock of heating oil and to avoid the price risk by signing a contract with an "agent" according to which the distributor sells the 100,000 barrels of heating oil to that agent at a set price (say 60 cents) for delivery in December. In this way, the price risk is transferred to that agent and the distributor will bear no loss if the price drops by December. He has sold his heating oil inventory at the price of 60 cents a gallon, and he will receive this price regardless of the spot price in December. All the loss will be borne by the buying agent. Of course, in such a risky market

situation, everything may work the other way around. The price of heating oil may jump to 70 cents a gallon. The distributor would have earned $420,000 in capital gain if he had not signed the contract. But since he has signed the contract, the buying agent will receive the gain. That is, the buying agent accepts the risk and, therefore, will receive all the possible gains and losses associated with risk.

What will happen in December? The distributor will need the heating oil for delivery to his own customers but, at the same time, he has an obligation to deliver the heating oil to the buying agent. This is where the "futures market" mechanism solves the problem. The buying agent has the option of reselling his contract to the initial seller (our hypothetical distributor) or to any other agent. Thus, by the time the contract is due, the distributor buys back the contract (of course at a different price).

The futures market mechanism provides two important facilities for this distributor. First, by December when the distributor wants to buy back his contract, the futures market (almost) guarantees that he can purchase the contract and avoid the actual delivery of the heating oil to the buying agent. This is due to the fact that the contract itself will have its own market along with its own demand and supply forces. The contract will then always be available to buy or to sell at the appropriate price. Second, the distributor's possible loss or gain from selling and rebuying the contract is (normally) offset by his gain or loss on the value of his inventory due to the change in the spot market price so that he protects himself from the market risk.

Figure 2.1: A HEDGE

Status:

A distributor is holding 100,000 barrels of heating oil to deliver to his customers in December.

Concern:

He is concerned that petroleum prices may fall by December and he may lose on the value of his inventory.

Hedging Action:

(1) He signs a contract with an "agent" and sells 100,000 barrels of heating oil for delivery in December at the present market price.

(2) He buys back (liquidates) the above contract in November at the then current price.

Results

(1) He loses, or gains, in the value of his inventory in proportion to the fall, or rise, in the price.

(2) He gains, or loses, in the value of his contract with that agent in proportion to the fall, or rise, in the price.

(3) His loss, or gain, in (1) is offset by his gain, or loss in (2).

Futures market provides the distributor with:

(1) A place to find that buying "agent".

(2) The possibility to buy back his contract in November.

Market Participants

Our aforementioned distributor intended to protect himself from the risk associated with a change in the price of heating oil. He is normally called a "hedger". In order to find someone who is willing to take over the risk of the price change, the distributor goes to a "futures exchange". A futures exchange is nothing more than a central meeting place for buyers and

sellers (or their representatives) to transact business. They enter into special contracts for the future delivery of commodities: these contracts are known as "futures". Each contract specifies the exact quality of the commodity, the month of delivery, and the place (or places) at which delivery is to be made. A futures contract is a promise on behalf of the seller to deliver within a specified month, and a promise on behalf of the buyer to take delivery of a standard quality and quantity of the commodity at an agreed price. However, in most futures markets, only a small fraction of contracts sold is closed by delivery of the commodity. Since nearly all participants are motivated by the desire to trade on price movements, they liquidate by undertaking offsetting transactions. The buyer can liquidate his position in the futures market prior to delivery of the commodity by selling contracts of the same futures. For each contract purchased or sold and subsequently liquidated, the trader takes a total profit or loss equal to the differences between his buying and selling price multiplied by the number of units of the commodity specified in the contract.

Three groups of people are involved in the futures market. First, there is a "selling hedger" who is a producer or a stockholder who possesses (or will possess) the commodity and wants to protect himself against a fall in its price; he will sell a futures contract to hedge against a price fall. Second, there is a "buying hedger" who is again a user or stockpiler of a commodity. He will need the commodity for sometime in the future; he does not intend to buy it now. He buys a futures contract to hedge against a possible price rise. Third is the speculator. He participates in both buying and selling of futures. He is neither a producer nor a stockholder nor a user of the commodity. This individual enters the market with only one goal in mind--to make a profit from correctly anticipating the direction of prices. By assuming the risk that the producers and processors desire to avoid, the speculator stands to lose money if his judgment proves wrong.

SELLING HEDGER:

A selling hedger, a person in the first group, will take a "short position" in the futures market and a "long position" in the actual (spot) market. For example, a jobber who is going to have 100,000 barrels of product in his inventory next month is called "long in the actual market." The hedging action would require him to sell a 100,000 barrel futures contract for delivery the next month. He will be short in the futures market.

If the spot market price (also known as the cash market price) of petroleum products is currently $23 per barrel, the jobber's position in the market is worth $2,300,000 because he is holding 100,000 barrels. His position in the futures market is also worth $2,300,000 because he has sold 100,000 barrels of the next month's delivery at the price of $23 per barrel. Now

let us assume that by the next month, the spot market price drops to $21 per barrel. The jobber's position will then deteriorate from $2,300,000 to $2,100,000; that is, he will have a $200,000 capital loss in the spot market. However, at the same time, he buys back his futures contract. The spot price having declined by $2 a barrel, the futures prices has declined by almost the same amount. Consequently, he will buy back the futures contract at $21 a barrel. Since he had sold this contract at $23, and is now buying it back at $21, the gain on futures trading ($2 x 100,000 = $200,000) offsets the loss in the spot market. This situation is normally known as a "perfect" or "efficient" hedge. In practice, however, the spot market price and the futures price may not move in such a parallel fashion and therefore the gain and loss to the hedger may not completely offset each other.

BUYING HEDGER:

A "buying hedger", a person in the second group, will take a short position in the spot market and a long position in the futures market. For example, a refiner decides he needs 200,000 barrels of crude next November. He does not need to buy the crude now. However, he fears that by next November the price of crude may have gone up. To avoid the price risk, the refiner buys 200 November contracts (each contract is for 1,000 barrels). If prices happen to go up during this period, he will not be affected by the price increase because he has already made the deal at the specific price; if, on the other hand, prices decline, the refiner will not be able to gain from the price decrease because he has obligated himself to buy the crude at the agreed price.

It is, however, important to note that a "buying hedger", the refiner for example, does not normally use the futures market as a source of supply. It is true that the refiner can plan on taking delivery; in such a case, the seller of the contract is obligated to make the delivery. However, the usual practice is to close the futures contract before its maturity date. That is, futures transactions do not really require the physical delivery or even physical existence of the oil being traded. Participants simply sell an "obligation to take or make delivery", and buy back this obligation before it reaches maturity. Thus the refiner buys his crude on the spot market at the same time that he sells his futures contract. His gain or loss on a futures contract will compensate for the change in the spot value of the crude so that he is not affected by any price movement occurring between the present and next November. He is still using the spot market as the source of supply, but utilizes the futures market to protect himself against price variations.

SPECULATORS:

A speculator, a person in the third group, will sell a futures contract when he expects the prices to go down. He may sell oil futures to a refiner who will need the crude in two months. The speculator does not own the oil he contracts to deliver; nor does he want to own that oil. His only aim is to profit on a downward price movement. Thus, if the price does indeed fall between the time he sells the oil futures and the time he must deliver it, he will make a profit. He can then enter the market and buy back his contract at a profit without even having seen a barrel of oil. Conversely, the speculator will lose money if his judgment proves wrong and he must purchase the oil futures contract at a price higher than the price at which he initially sold the contract. In the same way, a speculator will buy oil futures if he anticipates a price rise. Again, he will sell his futures before maturity (the delivery month) and will make a profit if the price has gone up.

Why Some People Hedge and Some Speculate

In the early discussions and writings on futures trading, the hedger was often described as an apparently "unsophisticated" participant in futures trading who regards the making of prices as a full-time occupation for "experts". Speculators, on the other hand, were viewed as "professional dealers" who study the market systematically and have access to more information. Thus, the speculator receives a premium for his higher level of "wisdom" and "sophistication".

A somewhat more classical explanation for the speculator's role in the futures market is that people are naturally different: some avoid risk and others take it. The discussion about the behavior of so-called "risk averse" people versus "risk lovers" and "risk neutral" individuals is very involved and theoretical. And, despite its intellectual appeal, it has not yet provided much explanation for practical issues concerning the futures market. In particular, the theory offers little explanation as to why a company (whose decision makers may presumably consist of risk averters as well as risk lovers) should consistently act as a speculator or as a hedger.

A more recent explanation for futures trading is that both sellers and buyers of any futures contract base their decisions on speculation. However, two different types of information are available to them and may result in two different types of speculation. In this respect, the futures market is assumed to provide a means of sharing information. This information may come from several sources. First, speculators may have studied the market conditions and acquired information that is not readily available to others. Second, each speculator may specialize in a certain part of the

market (e.g. demand for oil by a sector or region, or supply by each group of producers): his participation in futures trading will move the price towards the direction indicated by this special information. Third, the futures market provides a means of pooling all the information that individual suppliers and consumers may have about conditions in the futures market.

According to the above theory, speculation takes place based on the endowment of information. Agents or individuals who have access to more accurate information receive more profit from their engagement in futures trading. Therefore, these agents or individuals sell their information (or at least part of it) and the speculative gain they acquire is the price for this information.

Holbrook Working, a prominent leader of the field, and his followers have introduced a new theory regarding speculation and hedging in futures markets. According to this line of reasoning, the hedger does not primarily seek to avoid risk. Rather, he hedges because of an expected return arising from anticipation of favorable relative price movements in the spot and futures markets. It is not realistic to view the trader purely as a hedger or a speculator. Each trader chooses a combination of hedging and speculation as a form of "arbitrage". This line of reasoning is probably one of the initial attempts to analyze the fundamentals of futures trading within the framework of the conventional theories of economics.

Mr. Working views both hedging and speculation as "multi-purpose" trade decisions which are, at any time, aimed at various goals. On the "hedging" side, he speaks of five different types:

- carrying-charge hedging
- operational hedging
- selective hedging
- anticipatory hedging
- pure risk-avoidance hedging

Carrying-charge hedging is done simultaneously with the holding of the commodity stock for direct profit from storage. Operational hedging is done to facilitate operations involved in the merchandizing or "processing business". Selective hedging refers to the incomplete hedging and is also based on price expectations, but is used by producers and processors as substitute for a merchandizing contract. Finally, pure risk-avoidance

hedging may be what people have in mind when they talk about hedging. Mr. Working's main argument is that pure risk-avoidance hedging is almost non-existent in the real world. That is, hedging is (almost) always aimed at several objectives, one of which may be risk avoidance.

With regard to the other side of trading, Mr. Working classifies the role of speculation in futures markets into four categories:

- price-level trading (or position trading)
- news trading
- scalping
- trend trading.

Price-level trading refers to speculation based on the economics of the market. The speculator uses his information about the demand and supply of the commodity to judge whether the current price is higher than, lower than, or equal to the level warranted by market conditions. News trading refers to the type of speculation that is based on early access to news about the demand and supply of a commodity. The trader makes his move based on such news and then publicizes the value of that news in determining market movements. Scalping is concerned with buying on price dips and selling on price bulges. These dips and bulges normally arise from speculative buying or selling, and last for a very short period of time (a few minutes to a few days). Finally, trend trading refers to profit speculations from "riding" the price trend. Again, Working's argument is that speculative trading is always a combination of several types of trading and one cannot limit the explanation of speculative trading to only one of these types.

Investment Opportunities

Traditionally, the return on investment in futures trading has been known to include a risk premium. Hedgers wish to avoid the risk of any price movement. Speculators provide the hedgers with a price-insurance service. They are paid for this service in the form of an insurance premium that materializes as a discount on the futures prices as compared with the spot market price which is expected to prevail at the maturity date of the futures contract. Thus, investment in futures trading is somewhat more risky than investment in, let us say, stocks and bonds. However, the risk involved in futures trading is related primarily to the mechanism of futures trading.

Investment in a futures market differs in an important way from most other investments. An investor in stocks and bonds, for example, has to pay the total amount of his investment at the time he is making this investment. Clearly, he can borrow part of the funds, but essentially there is no difference in the opportunity cost of his investment. Commodity contracts, on the other hand, present the investor with a different situation. The contract is an agreement between a seller and a buyer for the delivery of a commodity at a specified date for a specific price. The initial investment on this agreement is a relatively small deposit to assure the financial ability of the buyer and seller. This deposit, called the margin, is normally 3-5% of the value of the contract being traded.1/ However, the gains and losses of the contract to the investor are based on the total value of the contract. For example, if an investor buys a contract of 1,000 barrels (42,000 US gallons) of heating oil at the price of 60 cents per gallon, the value of the contract will be ($0.60 x 42,000 = $25,200). The margin he deposits is only about $1,000. If the price of heating oil goes up by 10%, his profit will be $2,520. If we compare this profit with the initial money he invested ($1,000), the rate of return will be about 250%. In the same manner, a 10% decline in the price of heating oil will result in a loss of about 250%. Thus, investment in futures trading involves a high (positive or negative) rate of return only when profits or losses are compared with the deposited margin.

1/ The margin for petroleum futures was about 4% until 1984. With increasing volatility of petroleum prices, the margin has been now increased to 15% to 20% of the contract value.

Figure 5.3: LOSERS AND WINNERS OF THE GAME

Hedgers

* They buy a price insurance at a low premium.

Small speculators

* They are the net losers of the game.

Large speculators

* They maintain more comprehensive and updated information about the market.

* They have the financial ability to stay in the market for a longer period of time.

* They are the net winners of the game.

The above explanation of the investment mechanism in futures trading indicates that this investment should, in general, be much more risky than investment in stocks and bonds. However, empirical research has shown that while the average return on futures trading is about the same as that of common stock, the variation of the rate of return in futures trading is less than that of common stock, given that one holds a diversified portfolio of commodity futures. That is, investment in futures trading is, on average, less risky than common stocks. Furthermore, the rate of return on futures trading is substantially higher than the return on common stocks during inflationary periods: futures trading provides a better hedge against inflation than does investment in common stocks. However, during years of low inflation, common stocks yield a higher rate of return. All of the evidence suggests that an investor who keeps a portfolio of bonds and stocks may be substantially better off to include some holdings of futures contracts in his portfolio. This suggestion has been empirically supported only when the investor holds a diversified combination of commodity futures.

In short, investment opportunities in futures trading are not homogeneous to all traders. Empirical research has shown that hedgers do not pay much "insurance premium" and, thus, there is no guaranteed minimum return to be gained by all speculators. Rather, speculators win from each other. Large speculators usually make a consistent profit, while small speculators are,

on average, the net losers of the trade. To be a winner, one has to be a better speculator than others.

CHAPTER 6

EVOLUTION OF FUTURES MARKETS

From Forward Contracts to Futures Trading

Futures markets have evolved from the so-called "forward trading", which dates back at least to the seventeenth century. A forward contract is an agreement for the sale (or purchase) of a commodity at a specified time in the future at a certain price. Its major difference from a futures contract is that the forward contract is not standardized with respect to quantity, quality, and location of trade. Rather, each contract is tailored to the special needs of a specific seller and buyer.

The formal emergence of futures markets occurred in the nineteenth century when futures trading started in the US, UK, Germany and elsewhere. The oldest commodity exchange in the US is the Chicago Board of Trade (CBT), which was founded in 1848 and started futures trading in 1865. Other exchanges started their trading in the second half of the nineteenth century.

Futures markets currently exist for a wide array of real and financial assets including grains and feeds, livestock, industrial raw materials, precious metals, financial instruments, and foreign currencies. In particular, the last two decades have witnessed a dramatic increase in the types of contracts traded, and in the volume of transactions and open interest. In the US, the volume of transactions in futures increased from less than 4 million contracts in 1960 to over 200 million in 1987. The average open interest increased from about 140,000 contracts in 1960 to about 4 million in 1987.

Many European countries have also observed expanding futures markets. London exchanges are actively involved in futures trading of cocoa, coffee, copper, cotton, grains, rubber and metals. Bourse de Commerce of Paris and Stitching Cocatermijn market in Amsterdam have turned into important futures markets.

In Asia, there are numerous commodity exchanges in Japan, India, Malaysia, and Singapore. The most important exchange in Japan is the Tokyo Grain and Commodity Exchange. In India, there are a number of exchange that trade cotton, groundnuts, etc., while in Malaysia and Singapore there are futures markets in rubber.

What are the main factors behind the development of futures markets? Why have the futures trading of some commodities expanded so vastly while many other commodities have never been subject to futures trading, or have failed to become futures commodities after being introduced on one or several exchanges in the US or other countries.

A futures market typically develops in response to economic forces in the spot market. If the characteristics of the spot market are suitable, a futures market will emerge. After its development, the futures market will facilitate the operation of the spot market. Thus, futures markets are not invented or imposed on the spot market, but evolve out of the need for the performance of functions that the existing marketing system is not performing effectively.

Futures trading was introduced in response to seasonal fluctuations in the supply of crops. In particular, many authors refer to the corn trade in Chicago as an important step in the emergence of forward and futures contracts. In fact, a review of the Chicago corn trade is a useful exercise in understanding the prospect for futures trading in other commodities.

After the opening of the Illinois-Michigan canal, substantial corn trading started along the river. Farmers produced corn and hauled it to local elevators. Merchants build corn cribs for subsequent shipment to Chicago.

Farmers hauled corn during the late autumn and winter when the roads and/or canals were frozen. The merchants stored the corn until spring and then shipped it to Chicago. The merchants, of course, had to make a relatively large capital investment to build and maintain the inventory. At the same time, however, farmers wanted payment on delivery of the corn to the merchants. Merchants, then, needed considerable liquidity while they were taking the risk of a decline in price by the spring when they were going to ship and sell the corn in Chicago. And the merchants could not get much help from the bankers: because of the great price risk involved in holding corn from autumn to spring, bankers were reluctant to make large loans on the unsold corn. Thus, the price risk was a barrier to the efficient operation of the market by all agents involved in the market: farmers, merchants, financial institutions and consumers.

A logical extension of the market was the development of forward contracts. The merchants would go to Chicago and make a contract, at a firm price, for the delivery of corn in the spring. This forward contract would solve many of the problems in the market: bankers would view the forward contract as a desirable collateral for issuing loans; merchants would be free of price risk and behave more rationally while dealing with farmers; farmers would

find more suitable market conditions, adding to the efficiency of their operation.

Forward contracting, which then became a common practice in trading other agricultural crops, was initially limited to individuals who were somehow involved in the production, storage, processing or consumption of these commodities. However, as time passed, four new dimensions were incorporated into these contracts, which finally led to the formal introduction of futures trading. First, for the purpose of promoting the commerce of Chicago, the city's Board of Trade was designated as the official agency for the measurement, weighing and inspection of grains. This led to the development of quality standards which, in turn, facilitated the trade even for those who did not know much about grains. Second, an organized exchange (Chicago Board of Trade) was introduced as the market-place for those who wanted to buy or sell forward contracts. Third, contracts became increasingly transferable allowing a buyer of a contract to sell his contract before the time of delivery. Fourth, the trading of forward contracts was expanded to cover a new group of people--speculators--who were not actually involved in the production, storage, processing or consumption of the commodity, but who viewed the forward contract deals as " a paper market", which was very suitable for making a fast profit.

In the above manner, forward contracting developed into futures trading. The administration of futures trading, however, has gone through many ups and downs since its inception. Numerous modifications have been made to the rules of trade and the organization of various exchanges. More importantly, the attitude of legislators and public authorities with regard to the nature and legitimacy of futures trading has changed significantly.

In 1867, the Illinois legislature passed a bill that declared all futures contracts void and a form of gambling, except for cases in which the seller was the owner or agent for the owner of the grain at the time the contract was made. Similarly, many other public authorities objected to futures trading, perceiving it as an instrument speculators could use to manipulate the spot market. Speculators, on the other hand, had found futures trading an exciting game holding out the promise of huge profits. They rushed into the futures markets and took the play away from commercial traders. Public concern grew over the price distortion and even the "immorality" of futures trading. Consequently, futures trading became subject to increasing government influence and control.

Currently, futures trading is a closely regulated activity. The purpose of the regulation is to maintain the "competitiveness" and "fairness" of the trade. To this end, the regulatory body of each country attempts, in one way or another, to govern the relationship of an exchange with its members

and that of the members with each other. The appropriate level of government intervention is still subject to controversy. However, futures trading is now a publicly accepted activity which is viewed as an example of a competitive market.

In the US, futures markets were first regulated by the federal government in 1921. In the early 1930s, futures trading turned into a legislative issue and Congress passed the Commodity Exchange Act, which assigned to the Department of Agriculture the responsibility for monitoring the activities of futures trading: this was obviously due to the fact that futures trading was then limited to agricultural commodities.

After the significant increase in the level of futures trading in the early 1970s, Congress decided to establish an independent federal agency to pursue the task. To this end, the Commodity Futures Trading Commission (CFTC) was created in 1974. CFTC has been charted by Congress to license futures exchanges, to approve the terms and conditions of any futures contract before it is introduced on an exchange, and to monitor the implementation of commodity regulations on all US exchanges. CFTC is especially responsible for detecting and investigating the problems of market manipulation.

Futures Trading in the Petroleum Market

Although futures trading in the petroleum market is a recent phenomenon, forward trading has existed in this market for a long time. Contract sales with fixed (or predictably fixed) prices have served the industry as a form of forward trade for several decades. However, at present, revisions, discounts and premiums to the posted price are becoming the rule rather than the exception. Furthermore, many contract prices are now related to the spot market price. A recent study has estimated that about 50% of petroleum trade is either based on the spot price or transactions in the spot market. Thus, contract sales have lost their forward-trading characteristics, creating an opportunity for futures trading to provide price insurance to petroleum traders.

Petroleum futures developed in response to instability in petroleum prices. "First-generation" petroleum futures were introduced in 1974,1/ reflecting the reaction to the 1973-74 fluctuations in the price of oil. These futures failed for various reasons, the most important of which was the relatively stable price that prevailed in the market in 1975. "Second-generation"

1/ The first energy futures was a propane contract introduced on the New York Cotton Exchange in 1971. This contract was amended in 1981 and has since experienced moderate trading.

petroleum futures started with the introduction of a heating oil contract in 1978; it then expanded to include several futures in crude oil and petroleum products.

First-generation futures trading in the petroleum market started with the introduction of a crude oil contract on the New York Cotton Exchange in autumn 1974. The contract called for the delivery of crude at Rotterdam. Technical specifications of the contract (34^{o} API and 1.7% sulphur content) matched those of Saudi light crude. However, the contract provided the seller with an option to deliver other qualities (varying from 27^{o}-45^{o} API and 0.1-0.3% sulphur content) of crude at a discount or premium. In the same year, the New York Mercantile Exchange introduced two contracts--a Bunker C futures and a gas oil futures--both of which required delivery at Rotterdam.

All of the first-generation contracts failed to attract the petroleum industry and faded into obscurity. There were several reasons for this failure, the most important of which was that petroleum prices did not fluctuate as expected. The international spot price of crude oil stayed between $10.30 and $10.46 a barrel during the period October 1974-December 1975. Price stability was further reinforced in the US by the Energy Policy and Conservation Act, passed by Congress in 1975. The Act limited the annual increase of the price of crude oil, leading to reasonable predictability of petroleum prices.

The second reason for the failure of these futures was the petroleum industry's lack of participation in trading these futures. The presumption that the petroleum futures market, like that of other commodities, can expand without the participation of the petroleum industry, proved to be wrong. The industry's lack of participation was, in turn, related to two discouraging factors. First, the requirement for Rotterdam delivery was a technical inconvenience for US refiners, jobbers, distributors, and consumers. Although the oil industry had been told that futures contracts provided financial protection and that there was no reason to worry about delivery, the industry could not see the rationale of buying or selling a contract for a delivery point so far away from the domestic market. Second, futures markets were unknown to the oil industry and there were serious concerns about its impact on the petroleum business.

Second-generation futures started with the introduction of two contracts on the New York Mercantile Exchange in November 1978. The first contract called for the delivery of No. 2 heating oil with an API gravity of 30^{o} and a sulphur content of a maximum 0.2%. The second contract called for the delivery of No. 6 fuel oil with an API gravity of 10^{o}-30^{o} and a maximum sulphur content of 0.3%. Both contracts were for delivery of 42,000 US

gallons (1,000 barrels) in the New York Harbor area. (The provisions of these contracts, as well as other petroleum futures, are discussed later.)

The No. 2 heating oil turned into a successful energy future after a few months of slow trading. Its trade volume reached 34 million barrels in 1979, followed by 238 million, 995 million, 1,754 million barrels in 1980, 1981 and 1982, respectively. The success of this contract is due to several factors. The volume of trade reached 12 million barrels per day in 1987. First, gas oil was exempted from price controls in more than 40 states in 1976. Second, the international price of oil has been very volatile since late 1978. Third, the complete deregulation of the US oil price by the Reagan administration in February 1981 forged a stronger link between domestic prices and volatile international prices. Fourth, NYMEX has consistently attempted to communicate the uses of its futures contracts to the petroleum industry.

The success of the heating oil contract encouraged NYMEX and other exchanges to introduce various other petroleum futures. In August 1981, NYMEX introduced another heating oil contract for delivery in the Gulf Coast area. This contract became dormant because traders were presumably more comfortable trading in the already established New York heating oil market. The volume of trade for the Gulf Coast heating oil was around 1.8 million barrels in 1981 and ceased in 1982.

In October 1981, NYMEX introduced a contract for leaded gasoline. The delivery location for this contract was New York Harbor and the unit of trade was 42,000 US gallons. This contract has recently become very successful. Its volume of trade has increased from 7 million barrels in 1981 to about 3,000 million barrels in 1987.

Finally, on March 30, 1983, NYMEX introduced a crude oil futures contract. This contract calls for the delivery of 1,000 barrels of sweet crude at Cushing Storage, Oklahoma. The par crude is West Texas Intermediate with 40^{o} API and 0.4% sulphur content. However, other types of crude (UK Brent Blend, Nigerian Brass Blend and Bonny Light, Norwegian Ekofisk, Tunisian Zarzaitine, Algerian Saharan Blend, Mid Continent Sweet, New Mexican Sweet and South Texas Sweet) are all acceptable for delivery at certain premiums or discounts. Cushing has been chosen as the delivery point because it is common for companies to trade crude oil there. Fourteen crude oil pipelines flow in and out of Cushing and an average of 35 million barrels of oil flows through Cushing each month. Crude oil futures started with an average daily volume of 700,000 barrels. Its total volume of trade during 1983 was 323 million barrels, and its average daily volume reached 5 million barrels in 1984. Today the trading volume is between 40 to 60 million barrels per day.

In addition to NYMEX, the Chicago Board of Trade (CBT) introduced petroleum futures in unleaded gasoline, No. 2 heating oil and crude oil. Unleaded gasoline futures commenced trading in December 1982. Each contract called for the delivery of 1,000 barrels of regular unleaded gasoline, standard Colonial Pipeline specifications, southern grade with a minimum of 87.0 and a maximum of less than 91.0 octane rating. The delivery location was the Texas Gulf coast, but the mechanism of delivery was the so-called "depository receipt" method. This method required that the seller of the contract obtain a depository receipt from an issuer approved by the exchange.

The volume of trade of unleaded gasoline on CBT was about 8.7 million barrels in 1982, which represented an average daily volume of about 600,000 barrels. In early 1983, the volume increased to an average of 800,000 barrels a day. However, since April 1983, it started to decline and went dormant by end of the year. The main reason for the failure of the contract seems to be its delivery method. Oil traders prefer a wet barrel delivery to the depository receipt system.

In March 1983, CBT introduced a crude oil contract on the same day that NYMEX opened its crude oil futures. CBT's contract was also for 1,000 barrels of Light Louisiana Sweet, while other crudes (Bonny Light, Brass River, Ekofisk, Qua Iboi, Saharan Blend and Zarzaitine) would be deliverable at appropriate premiums or discounts. The delivery location was the Capline System in St. James, Louisiana, or other seller-designated port facilities in St. James, St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard or Plaquemines Parishes, Louisiana. The delivery method was "wet barrels".

CBT's crude oil contract initially performed better than the gasoline contract but eventually failed. Its total volume of trade in 1983 reached 93m barrels, which represented an average daily volume of about 400,000 barrels. However, the volume of trade declined over time and practically halted by end 1984. Trade analysts believe that the depository-receipts delivery method of unleaded gasoline and No.2 heating oil had a negative impact on the desirability of the CBT's crude oil contract. Traders would hesitate to take a simultaneous position in crude and product futures when the crude contract calls for wet barrel delivery and the product futures stipulate depository receipts. Further, the designated premiums for foreign crude discourage the trade.

Finally, CBT introduced a No. 2 heating oil contract in April 1983. This contract was for the delivery of 1,000 barrels of heating oil in Harris, Galveston or Jefferson Counties, Texas. The delivery method was the depository receipt mechanism. Despite the success of the heating oil contracts at NYMEX and the International Petroleum Exchange of London, the

CBT's heating oil contract did not experience high volumes of trading and died after a few months.

Benefitting from NYMEX's experience, a petroleum futures market was established in London. This market, called the International Petroleum Exchange (IPE), introduced its first contract in April 1981. The contract is for 100 tonnes (733 barrels) of gas oil and is priced in US dollars per contract. Delivery is designated at specified tank installations in the Amsterdam, Rotterdam and Antwerp area.

The total volume of IPE's gas oil trade in 1981 reached 14.9m tonnes, which is equivalent to 109m barrels: this represents an average volume of trade of 670,000 barrels per day. In 1982, the total volume of trade soared to 454m barrels, which indicates a daily trade volume of 1.8m barrels. The volume of trade in 1986 was about 770 million barrels.

The rapid growth of IPE's gas oil futures during 1981-82 was <u>not</u> primarily due to the entry of new traders in the market. Rather, it was the result of an increase in the level of trade activity by those already in the market. A survey, sponsored by IPE, has shown that about 160 companies use the IPE's gas oil contract. However, more than 50% of the total trade is accounted for by 25 companies. This finding indicates that the market can still expand in two ways: first, the volume of trade can grow significantly if the many small users already in the market intensify their trade to a level comparable with that of the leaders; second, the market can expand considerably by attracting new participants.

Encouraged by the success of its gas oil futures, IPE introduced a crude oil contract in November 1983. Each contract was for 1,000 barrels of Brent Blend, while other crudes (Ninian Blend, Forties Blend, Ekofisk Blend, Bonny Light, Brass River, Zarzaitine, and Saharan Blend) would also be delivered at appropriate premiums or discounts. The basis for delivery was into tank, pipeline or f.o.b. Rotterdam/Amsterdam or by in-tank transfer in Rotterdam/Amsterdam for deliveries of less than 50 lots. In addition, the contract terms provided an alternative delivery procedure under which the buyer and seller could agree (in the month prior to Rotterdam/Amsterdam delivery becoming due) to alternative delivery terms.

Crude oil trading on IPE was not successful. The total volume of trade during 1983 was about 2.8m barrels. In February 1984 the daily volume reached 77,000 barrels and then declined very sharply to negligible levels in March and April. IPE introduced a revised crude oil contract in November 1985 but it again failed to attract sufficient number of participants.

Statistical Trends

In presenting the statistical patterns of petroleum futures, two distinct measures of trade activity are used. The first measure is "volume" of trade: it simply shows the number of contracts traded during the period under discussion. The second measure is "open interest": this measure shows the number of outstanding contracts, bought or sold, that have not been offset by an opposite transaction or physical delivery.

For example, if agent A sells 100 contracts of November heating oil in the morning and buys 100 of the same contract in the afternoon, he has contributed 200 contracts to the volume of trade on that day. However, since his afternoon purchase of contracts offsets his morning sale of the same contracts, his transactions do not affect the level of open interest. Thus, roughly speaking, "open interest" shows the level of trade while "volume" shows the intensity of trade.

As discussed previously, NYMEX is now the main exchange for petroleum futures trading. The volume of trade and open interest for NYMEX's contracts are given in Annex C.

Oil Industry Participation

Despite an initial resistance to the development of petroleum futures, petroleum industry has taken an active role in futures and options trading. A survey carried out in 1987 indicates the integrated oil companies account for about 21% of traders at NYMEX. Every oil company, whether large or small, takes risks in order to be productive and profitable. Each segment of the business from upstream exploration for crude oil to downstream refining and marketing of refined petroleum products involves risk. Integrated oil companies must balance the total system from crude production to product distribution to produce the most profitable product slate. Companies strive to establish the best cost/value relationship available in each operating segment in order to maximize profit margins. This requires significant know how, management skills, and operating flexibility with respect to refinery processes, market economies and changing product inventories and demand. Because of limitations on each company's supply, refining, and distribution system this creates risk and price exposure which must be managed. It requires a continual process of pricing, buying, selling, trading and scheduling of various crude oil and products to balance system supplies.

Energy futures contracts are used by large integrated oil companies to provide accessibility and visibility of market prices for the purchase and sale of physical oil. Liquidity in the futures markets ensures that

specific hedging strategies can be successfully processed. Production can set forward sales prices. Refining operations can be hedged using crack spreads to set profit margins by fixing differentials between crude oil and product prices. In addition, margins on the distribution of petroleum products can be set.

The advent of options on underlying crude and heating oil futures contracts (see Chapter 8) has introduced the concept of the "managed hedge" at a known cost, i.e., the premium. Options provide the ability to hedge crude and heating oil cash and futures positions against adverse price movements without foregoing all the benefits of favorable price movements. Options also allow a company to fine tune a hedge by allowing a choice of hedging insurance at different levels, costs and degrees of protection.

An interview 2/ with the marketing and trading executives of three oil companies--Phillips, Conoco, and CITGO--provides some insights into the manner in which the petroleum industry uses the futures market.

Phillips Petroleum Company is active in petroleum exploration and production on a worldwide basis with petroleum refining and marketing operations in the United States. As operations managers have become more familiar with the hedging tools available and the appropriate risk strategies to implement, participation in the futures and options markets has increased. The company entered the market in order to maintain a competitive edge as oil markets became deregulated and as volatility became more visible. Phillips found the futures markets provided an index for price discovery and immediate market information. Liquidity in the NYMEX markets provided the company with the necessary flexibility and ease of entry and exit in order to process specific hedging transactions. The company hedges crude and heating oil cash and futures positions against adverse price changes without foregoing all the benefits of favorable price movements. Options provide insurance at a limited known cost. Its current hedges include: (i) refinery supply crude prices; (ii) purchase/sales for supply; and (iii) inventories in tankage.

Phillips continues to formally segregate trading operations. Formal strategy meetings, however, are held with supply, refining and marketing personnel to discuss open positions and proposed hedging strategies. At the same time frequent informal contacts between traders and supply/marketing staff are maintained. In order to maintain the appropriate operational and accounting controls for its futures and options hedging program, the trading department reports directly to the vice president of supply and transportation.

2/ The Energy in the News, Third Quarter 1988.

CITGO Petroleum Corporation, a petroleum refining, marketing and transportation company is jointly owned by the Southland Corporation and Petroleos De Venezuela, S.A. each with a 50 percent equity interest. CITGO operates a 320,000 barrel per day high conversion refinery at Lake Charles, Louisiana. It also operates a wholesale marketing operation primarily for gasoline and distillate fuels consisting of 41 equity owned refined product terminals. Gasoline sales are distributed in 42 states through 2,600 of Southland's 7-Eleven convenience stores and 5,400 jobber outlets. CITGO also markets jet fuel, distillates, lubricants and other petroleum products. CITGO initially used futures as a hedging mechanism against physical product inventory in New York Harbor. Today the company uses futures to hedge crude, refined products, intermediate feedstocks and blending components in New York Harbor, U.S. Gulf Coast and Chicago. Additionally, futures are used to supplement cash purchases/sales, minimize basis risk either on a location or product basis and to lock in transportation economics when delivering system supplies of products. CITGO also utilizes options. Heating oil options are used to protect physical heating oil inventories by purchasing puts, and/or to enhance cash flow by selling covered calls.

Conoco Inc., is a major integrated oil firm and operates as a subsidiary of Du Pont. Conoco's petroleum exploration and production activities include the production of crude oil in the United States and Canada and abroad in the North Sea, Middle East, Africa and Indonesia. Petroleum refining, marketing and transportation operations are also conducted by Conoco, which manufactures and sells a wide range of petroleum products. These include gasoline, jet fuel and diesel fuel for transportation markets; distillate; residual fuel oil, asphalt, and petrochemical feedstocks. The company sells gasoline and other refined products through retail outlets in 41 states. As a result of an uncertain pricing environment, more intense competition among firms in the industry and decreasing margins, the company needed a vehicle to manage increased price risk, and for price discovery. Conoco began using heating oil futures in the early 1980s but found crude oil options a more flexible instrument for hedging. Conoco, as an oil producer, purchases put options to protect its cash or futures position against a price decline. Conoco also uses options to implement strategies specific to their own wet barrel system. For example, the company sells in-the-money options on expectations of buying futures that are delivered into their Oklahoma system via an Exchange of Futures for Physicals (EFP). At the same time, the company sells options against oil inventories to earn premium income. The company also incorporates options into marketing programs by guaranteeing price ceilings for their customers.

Table 6.1: PARTICIPANTS IN NYMEX'S ENERGY FUTURES IN 1987
(Number Of Companies)

	Crude oil futures	Heavy oil futures	Unleaded gasoline futures
Integrated oil companies	12	11	12
Refiners	8	4	9
Producers	4	-	-
Trader-resellers	7	14	12
Traders	17	16	22
End-user	-	-	-
Total number of participants	48	46	56

CHAPTER 7

THE RULES OF THE GAME

Organization of a Commodity Exchange

To participate in future trading, one cannot merely walk into a futures exchanges and start making bids and offers on futures contracts. One must be a member of the exchange to be able to engage in such transactions.

A commodity exchange is a voluntary association of people whose business involves, among other things, trading in commodity futures contracts. Most of these exchanges have developed out of organizations trading in spot markets. Thus, each exchange has its own history and tradition and each is independent of the others. The primary aim of a futures exchanges is to provide and regulate a trading place so that its members (and through them, other interested parties) have the facility to sell or buy futures contracts for specific commodities.

Exchanges are often referred to as nonprofit organizations. They provide facilities that their members can use to make a profit, but the association itself is not organized to make money. The membership in US exchanges is limited to individuals: that is, no memberships are held by companies. Each exchange has a certain number of members, and only these individuals are allowed to trade in futures contracts. Since the number of seats is fixed (occasionally the number may be adjusted by the board of directors), the only way to enter the association is to buy someone else's membership. Seats on some active exchanges are very valuable and are sometimes sold for several hundred-thousand dollars. The person interested in buying, however, should first apply to the membership committee of the exchange and, if the application is approved, may then proceeded to purchase the seat.

Many people buy the membership of an exchange not because they want to get on the floor and trade, but because the commission cost is lower for members even when they are not present at the market and are represented by an agent. That is, if two individuals, one a member and one a nonmember, hire a broker, the nonmember pays a higher commission than the member.

Although memberships are held by individuals, many of them are effectively administered by companies. Most members are employees of companies whose business involves futures trading.

Once a member of an exchange, you can enter the exchange's trading floor (the "pit") of the commodity you want to trade (there are special trading

hours for each commodity) and make a bid or offer. The first person who accepts the bid or offer will get the trade. Observers at each pit overlook the trading and note the prices at which trades are made. These observers record the prices and feed them into their communication systems. Prices are then almost instantaneously displayed on the boards and are also communicated to the brokerage offices and commodity firms all over the world. When a trade is made, each of the traders makes a note on a card of the price, quantity, delivery month, and the person with whom the trade was made. This record is submitted to the "clearinghouse" for reconciliation on a daily basis.

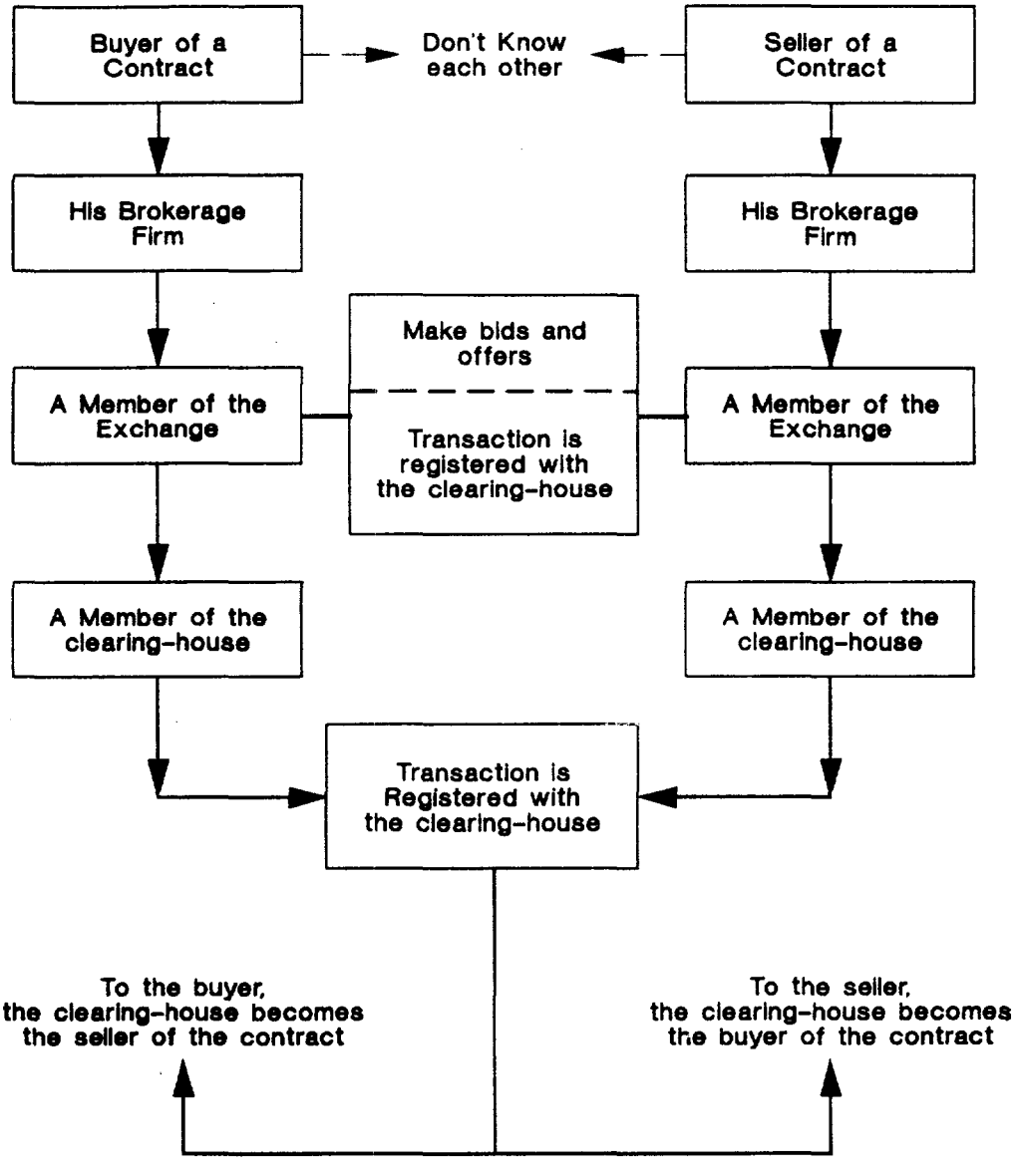
The Clearinghouse

Each commodity exchange has its own clearinghouse. The members of the clearinghouse are not necessarily the same as the members of the exchange. Owning a seat on the exchange entitles a person to trade on the exchange floor. However, any deal he makes has to be registered with the clearinghouse through a clearinghouse member. Each clearinghouse member has an account with the house. The member will then file a report with the house of the transactions that should be included in its account. After these transactions are checked to see if they agree with the trading recorded on the floor, the clearinghouse will become the "other party" to all buyers and sellers. Thus, a trader in the futures market does not need to be concerned about who took the opposite side of his trade. Any time he decides to liquidate his contract, he can do so without seeking the agreement of the other party. The clearinghouse guarantees performance of all contracts under the exchange rules.

To become a member of a clearinghouse, you have to satisfy relatively high standards of creditworthiness. This provides the clearinghouse with a strong financial basis. Each clearinghouse member is required to deposit an initial margin on its contract positions with the clearinghouse. In addition, each day the member must send the clearinghouse a variation margin on each outstanding net contract on which there has been a loss for that day. The clearinghouse has at its disposal all the deposited margins to satisfy its financial obligations. Furthermore, the clearinghouse can draw upon its "guaranteed fund", which is a financial reserve provided by all its members.

The clearinghouse provides a considerable facility to buyers and sellers in the futures markets. However, it should be noted that all of its functions are performed within the context of an intermediary agent. Thus, the clearinghouse does not earn any profit or bear any loss because of the futures deals--it simply redistributes the money from losers to winners.

FIGURE 7.1: HOW A CONTRACT IS TRADED



In short, in order to trade in a futures exchange, you have to act through a member of the exchange. That member can buy or sell futures contracts on the exchange floor. However, he may not be a member of the clearinghouse. He should then register his trade through a "house member". After this is accomplished, a futures contract is issued that declares the house member as one party and the clearinghouse, as the other party. In other words, unlike contracts in the spot market, futures contracts are not bilateral among traders; the clearinghouse acts as seller to every buyer and buyer to every seller.

Characteristics of Futures Contracts

As explained earlier, less than 1% of petroleum futures contracts ever reach maturity and are actually delivered. However, a futures contract is a valid, enforceable agreement. If the seller or the buyer should choose to make or take delivery, they may do so. Thus, the terms of the contract have to be precise and explicit.

A futures contract is standardized with respect to four elements (see Figure 7.2):

- the quantity to be delivered (for instance 1,000 barrels of oil);
- the quality or qualities to be delivered (for example, light sweet crude with less than 5% sulphur content and an API gravity in the range of 34-45);
- the time interval within which delivery is to be made (for instance, the month of October);
- the location or locations where delivery can be made (for example, Cushing Storage, Oklahoma).

Figure 7.2: CHARACTERISTICS OF FUTURES CONTRACTS

Futures contracts are standardized with respect to:

* the quantity to be delivered
* the quality to be delivered
* the time interval within which delivery is to be made
* the location or locations of delivery
* the method of delivery

They may included:

* specific premiums or discounts for variations in quality
* specific premiums or discounts for different delivery points

They normally contain limits on:

* the minimum price fluctuation
* the maximum permissible price fluctuation

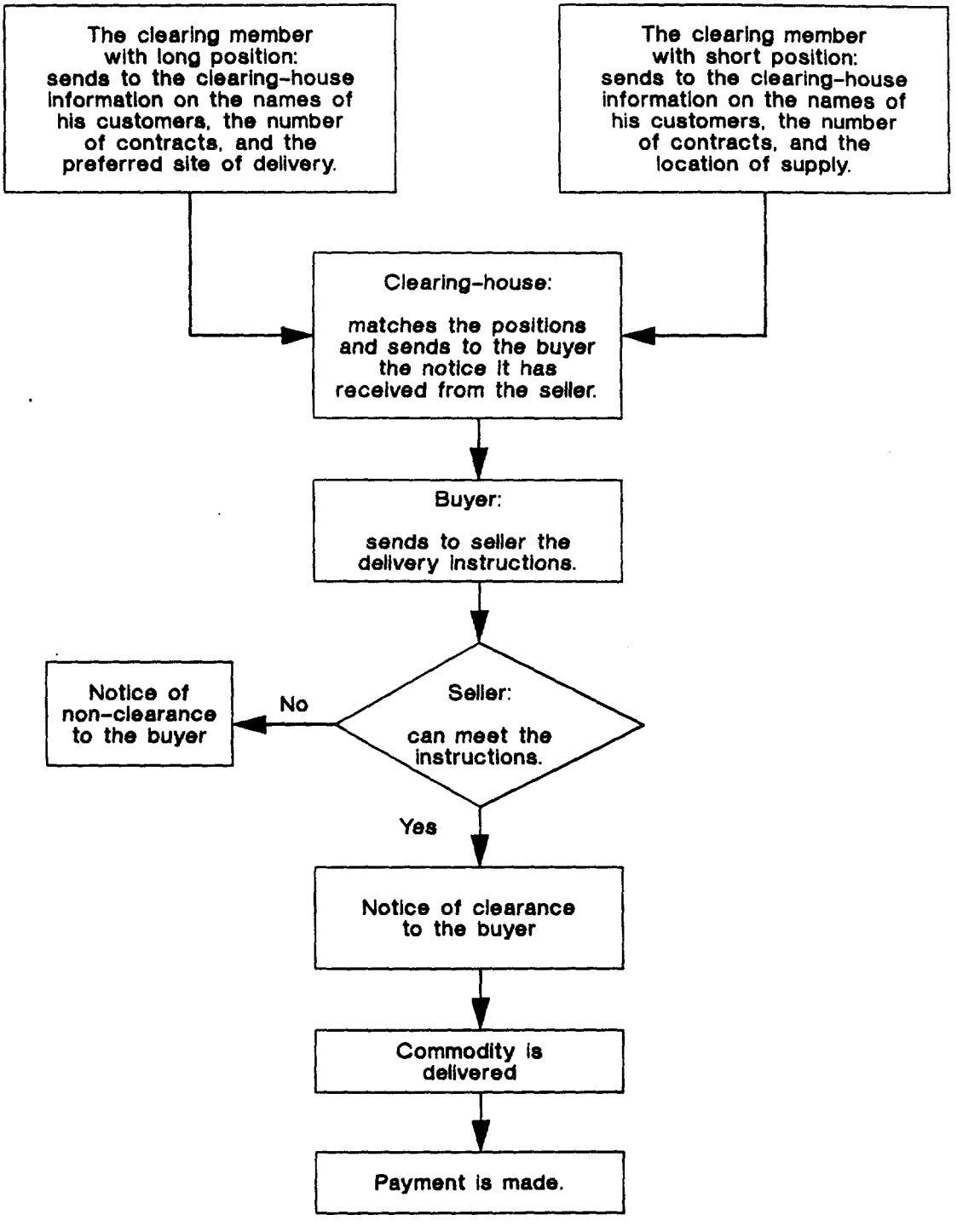
The contracts on US exchanges impose:

* a limit on the number of contracts that each person can hold.

In addition to the above information, futures contracts contain a considerable amount of detailed description of the characteristics of the commodity and the method of delivery. For example, the crude oil (light sweet) contract traded on the NYMEX contains the following information.

First, with regard to the grade and quality of crude, the contract states that the crude's viscosity should be 325 (or less) seconds Saybolt Universal; its vapor pressure should be less than 9.5 lbs per square inch at 100°F; its basic sediment, water and other impurities should be less than 1%; and its pour point should not exceed 50°F. The acceptable stream designations are: UK Brent Blend, Nigerian Brass Blend and Bonny Light, Norwegian Ekofisk, Tunisian Zarzaitine, Algerian Saharan Blend, Texas Intermediate, Mid and South Texas Sweet. The par crude is West Texas Intermediate with 40° gravity (API) and 0.4% sulphur. If the gravity is less than that of the par crude, there will be a 2 cents per barrel discount under the contract price for each degree gravity below par. (There will be no gravity adjustment if the gravity is above par.) If the sulphur content is different from that of the par crude, there will be a 5 cents per barrel premium (discount) over (under) the contract price for each 0.1% sulphur content

FIGURE 7.3: HOW THE DELIVERY IS MADE



less (greater) than par. Finally, delivery of Brass Blend, Bonny Light and Saharan Blend will entail a 25 cents per barrel premium over par.

Second, with regard to price fluctuations, the contract contains a set of rules which aim at starting the trade within a manageable range of price fluctuations and stretching this range as the market seems to have developed the capacity to absorb wider fluctuations.

These rules are:

- o the maximum permissible price fluctuation in any day is $1 per barrel above or below the preceding day's settling price (this is called the basic maximum fluctuation);

- o if the settling price for any month moves by the basic maximum fluctuation in either direction, the maximum permissible fluctuation in either direction for all months during the next business session will be expanded to 50% above the basic maximum fluctuation;

- o if the settling price for any month during a business session for which the maximum permissible fluctuation has been expanded does not move by the said expanded maximum fluctuation, the maximum permissible fluctuation for the next business session will be set back to the basic maximum fluctuation;

- o if the settling price changes by the expanded permissible fluctuation, the maximum permissible fluctuation will be expanded again to 100% above the basic maximum permissible fluctuation;

- o if the settling price does not fluctuate by this twice expanded range, the maximum permissible fluctuation will be set back to the initially expanded range (only 50% above the basic); and

- o there will be no maximum limit on price fluctuations during the month preceding the delivery month.

Thus, rule (a) establishes the initial range, while rules (b), (d) and (f) determine how this range is expanded. Rules (c) and (e) indicate the conditions under which the range of price fluctuation will be set back to its previous domain.

Third, the contract imposes a limitation on holdings of futures contracts. This is very important from the viewpoint of the economics of oil futures

because the limitation is aimed at barring the development of monopoly power in the market. According to the contract, no person should own or control a net long or net short position in light crude petroleum in any one month, or in all months combined, of more than 5,000 contracts. In addition, in the month preceding a delivery month, no person should own or control a net long or net short position of more than 750 contracts in light crude for the delivery month. The contract will also take a precautionary step by stating that: the positions of all accounts owned or controlled by a person or persons acting in concert shall be cumulated. The exception to this rule is the case of a so-called "bona-fide" hedger. If a hedger can show that the hedge is necessary or advisable as an integral part of his business (i.e. it is not a speculative act), his limit will be raised to 10,000 contracts (in any one month or in all months combined), and to 3,000 contracts in the month preceding the delivery month.

Fourth, with regard to the delivery procedure (see Figure 7.3), the contract provides that trading in the current delivery month shall cease on the fifth business day prior to the twenty-fifth calendar day of the month preceding the delivery month. A member who has a long position will give the clearinghouse a "notice of intention to accept delivery" by 12:00 noon on the first business day after the final day of trading. This notice should indicate the number of contracts to be accepted, the buyer's preferred outgoing pipeline or preferred storage facility and his preference of light "sweet" crude oil by origin, sulphur and API gravity. In the same manner, a member who has a short position will give the clearinghouse a "delivery notice" by 12:00 noon on the first business day after the final day of trading. This notice should indicate the number of contracts to be delivered, the origin, sulphur and API gravity of the light "sweet" crude oil to be delivered.

The clearinghouse will match the notices coming from both sides and determine the corresponding parties. The seller will then have until the last business day of the month preceding the delivery month to give the buyer a "scheduling notice" in which the seller states the delivery time. The buyer and seller are, of course, free to change (by mutual agreement) the delivery terms with respect to the method of delivery, timing of delivery, type of crude to be delivered, and designation of buyer's and/or seller's facility. In any event, after the delivery is arranged, the buyer must pay the seller by 12:00 noon on the twentieth calendar day following the delivery month and the seller will give the buyer the pipeline ticket and all other certificates and documents required for the transfer of title.

Specifics of Petroleum Contracts

This section provides a summary of the provisions of petroleum contracts traded in the US and a the International Petroleum Exchange of London.

PETROLEUM CONTRACTS TRADED AT NYMEX:

As discussed in Chapter 6, NYMEX has played a leading role in US petroleum futures trading in recent years. Its first successful contract was the New York Harbor heating oil contract which began trading in November 1978.

The heating-oil contract-unit is 42,000 US gallons (1,000 US barrels). Its delivery location is New York Harbor where, for the purpose of the contract, New York Harbor extends from the East River west of Hunts Point; the Narrows, the Lower Bay west of Norton Point, the Newark Bay, the Hackensack River and Passaic River south of the Pulaski Skyway Bridge, the Kill Van Kul, the Arthur Kill and the Raritan River east of the Garden State Parkway Bridge.

The quality specifications of the heating oil are:

Gravity	API 30° minimum
Flash:	130° minimum
Viscosity:	Kinematic, Centistokes at 100°F, minimum 2.0 maximum 3.6
Water and sediment:	0.05 maximum
Pour point:	0°F maximum
Distillation:	10% point, 480°F maximum; 90% point 640° maximum; End point 670°F maximum
Sulphur:	0.2% maximum
Color:	maximum 2.5

Delivery has to be made f.o.b seller's New York Harbor facility with all duties, fees and other charges paid by the seller. The buyer has the option of taking the delivery into his barge or truck, into tanker or pipeline, as a stock transfer of the title, or as an intra-facility transfer and inter-facility transfer of the oil if the facility used by the seller and buyer allows such transfer. The delivery can also be taken by truck, in which

case the buyer should pay a per gallon surcharge on the amount determined by the Exchange.

Following the success of the New York Harbor heating oil contract, NYMEX introduced in August 1981 another heating oil contract for delivery in the Gulf Coast area. This contract contains the same provisions with regard to contract unit and quality specifications. The major difference is, of course, the delivery location. In this contract, the delivery is made in the Gulf Coast area which extends from Pasadena, Harris County (Texas) to Collins, Covington County (Mississippi) and includes facilities located in Brazoria County (Texas) and Jackson County (Mississippi) which have access to Colonial Pipeline injection points in Pasadena (Texas) and Collins (Mississippi). As mentioned before this contract is not active at present.

Gasoline (leaded and unleaded) contracts were introduced on NYMEX in October 1981. The contract unit is 42,000 US gallons (1,000 US barrels) and the delivery location is New York Harbor. The unleaded gasoline should meet the following standards of quality:

Gravity:	API 52^{o} minimum
Color:	undyed
Corrosion:	3 hours at 122^{o}, maximum 1
Lead:	maximum 0.03 grams per gallon
Doctor:	negative or, if necessary, Mercaptan Sulphur: weight per cent, maximum 0.002
Octane:	RON, minimum 91.0; MON, minimum 82.0; (RON + MON)/2 minimum 87 and maximum less than 91.0
Reid vapor pressure:	maximum pounds, January, February--14.5, March, April - 13.5, May, June, July, August, September - 11.5, October, November - 13.5, December - 14.5

Northern Grade	Class
December, January, February	E
March, April, October, November	D
May, September	C
June, July, August	C

	B	C	D	E
10% evaporation ^{o}F maximum	149,	140,	131,	122
50% evaporation ^{o}F maximum	170,	170,	170,	170
50% evaporation ^{o}F maximum	245,	240,	235,	230
90% evaporation ^{o}F maximum	374,	365,	365,	365
End point ^{o}F maximum	430,	430,	430,	430

The standards of quality of leaded regular gasoline are the same as the above, except for:

Color:	orange or bronze in sufficient quantity to meet US Surgeon General's minimum requirements
Lead:	maximum 4 grams per gallon
Octane:	Ron, minimum 91.5; MON, Report; (RON + MON)/2 minimum 89.0

Prices of both contracts are quoted in dollars and cents per gallon. The minimum price fluctuation is 0.01 cents per gallon. The maximum permissible price fluctuation in any one day is 2 cents per gallon above or below the preceding day's settling price (called the "basic maximum fluctuation"). The maximum price fluctuation may be extended under special circumstances. If the settling price for any month moves by the basic maximum fluctuation in either direction, the maximum permissible fluctuation for all months during the next business session will be 50% above the basic maximum fluctuation. The maximum permissible fluctuation may again be expanded if the price change hits the new limit. However, there is no maximum limit on price fluctuations during month preceding the delivery month. This is to ensure that the futures price at the maturity date converges with the spot market price.

Trading of the current month's futures contracts will cease on the last business day of the month preceding the delivery month. By 12:00 noon on the first business day of the delivery month, both buyers (clearing members having open long positions) and sellers (clearing members having open short positions) must file with the Exchange the forms prescribed by the Exchange. The buyer will provide information regarding the names of his customers, the

number of contracts, and preferred site of delivery. The seller will file a form, called a "delivery notice", with the Exchange providing the number of contracts, the names of his customers, and the name and location of the facility that will supply the product.

The clearinghouse of the Exchange will match the size of the positions and will send the buyer the delivery notice that it has received from the seller. The buyer is then obliged to give to the seller (identified in the delivery notice) the initial delivery instructions. The seller will then give the buyer a notice of clearance indicating that he is prepared to make delivery in accordance with the buyer's delivery instructions, he must give the buyer a notice of "nonclearance" and state the reason for such inability. He may, at his option, in the notice of nonclearance suggest an alternative delivery site and/or a preferred delivery date or time. A copy of all communications between the buyer and the seller goes to the Exchange.

All the deliveries must be completed after the fifth business day and before the last business day of the delivery month. For the purposes of the contract, shipment is said to commence when the product passes the buyer's cargo intake flange, tank or pipeline connection, at which point the buyer assumes the risk of loss.

Finally, the buyer pays the seller at the office of the seller by certified check by 12:00 noon of the business day following receipt of the product. The amount of the payment is based on the volume delivered as determined at 60^{0}F.

The contract provides some flexibility to facilitate the delivery. The seller and buyer (matched by the Exchange) may agree to make and take delivery under terms and conditions that differ from those contained in the contract. In such a case, the buyer and seller execute an "alternative delivery notice" on the form prescribed by the Exchange and deliver a completed copy of such a notice to the Exchange. This action will release the buyer, the seller, and the Exchange from their respective obligations under the contract. Upon receipt of the notice, the Exchange will return to the buyer and seller all margin monies held for the account of each with respect to the contracts, and the Exchange is indemnified against any liability, cost of expense associated with the execution, delivery, or performance of the agreement between the seller and the buyer.

Petroleum Contracts Traded at the International Petroleum Exchange

The organization of IPE is somewhat different from the US commodity exchanges. The difference is due to: the types of membership of the

exchange; and the relationship between the Exchange and the clearinghouse. Membership of IPE is in two categories:

- floor membership with voting rights; and
- associate membership with no voting rights.

To become a "floor member", a trader must have a London office and minimum assets of £ 20,000 ($30,000). The floor member does not pay any commission on the trade and has a right to vote.

Associate members consist of two groups. First, trade members who are, principally, established oil trading companies: they pay a membership fee and participate in futures trading through a floor member, but pay a lower commission than those who are not members of the Exchange. Second, general associate members, who are mostly small companies and speculators: they cannot qualify for trade membership but are permitted to trade through the floor members.

The relationship between IPE and its clearinghouse is of interest because the clearinghouse is completely independent from IPE. The International Commodities Clearinghouse Limited has been providing futures markets in London with clearing services since its formation in 1888. It is now providing IPE with clearing services. Its operation is similar to that of US clearinghouses. It serves as a counterpart to each seller or buyer of a futures contract. It guarantees all contracts on the market and acts as an intermediary to arrange delivery, should the contract reach the maturity date.

The first contract introduced on IPE was gas oil futures, which began trading in April 1981. The contract unit is 100 tonnes and the delivery locations are at specific tank installations in the ARA (Amsterdam, Rotterdam and Antwerp) area. The contract price is quoted in US dollars and cents per tonne, and the payment should be made in the same currency in London. The minimum price fluctuation is 25 cents per tonne ($25 per contract); the maximum price variation in each trading session is $30 per tonne. If the price varies by $30 per tonne from the previous day's price, trading will cease for half an hour. It will then start with no maximum limit on the price fluctuation.

The quality specifications of the IPE gas oil contract are:

Density at 15°C:	0.855 kg per liter maximum
Color:	2.0 ASTM maximum

Flash point:	55^{o}C minimum
Total sulphur:	0.3% maximum
Cloud point:	-2^{o}C maximum
Cold filter plugged point:	-9^{o}xC maximum.

Trading of the current month's contract ends on the last business day of the month preceding delivery. If a contract reaches the maturity date, the delivery must take place between the fourteenth and the last day of the delivery month.

Encouraged by the success of the gas oil contract, IPE introduced a crude oil contract in November 1983. The contract is dormant now but is supposed to be re-introduced. The contract calls for delivery of a crude within the API gravity of 35^{o}-45^{o} with a maximum sulphur content of 0.4%. The par crude is Brent Blend with Ninian Blend, Forties Blend, Ekofisk Blend, Bonny Light, Brass River, Zarzaitine and Saharan Blend also deliverable, with appropriate premiums or discounts applicable. The choice of Brent Blend as the market crude facilitates trade because it is the largest crude volume traded on the European market. Furthermore, its similarities with West Texas Intermediate (par crude at NYMEX) and Light Louisiana Sweet (par crude at CBT) should encourage the simultaneous purchase and sale of futures (arbitrage) between IPE and the US exchanges.

The quality specifications of the IPE crude oil contract are:

Gravity:	API 35^{o} to 45^{o}
Sulphur:	0.4% maximum
Pour point:	50^{o}F maximum
Viscosity:	Kinematic, Centistokes at 50^{o}C, 45 maximum
Metals:	25 parts per million, maximum
Bottom sediment and water:	1% maximum
Reid vapor pressure:	10 lbs per square inch maximum.

The contract unit is 1,000 US barrels (as opposed to the gas oil futures, which were in units of 100 tonnes). Delivery should be made in the Rotterdam/Amsterdam area, f.o.b. ship, by inter-tank transfer, by in-tank transfer or "free in pipeline" at the buyer's option. However, when deliveries are less than 50 lots (contracts), the delivery will be made by in-tank transfer. Furthermore, if the buyer and seller agree on an alternative delivery procedure during the month prior to the delivery month, any location or crude may be used at agreed discounts or premiums.

The contract price is quoted in dollars and cents per barrel and the payment is made in US dollars in London. The minimum price fluctuations is 1 cent per barrel.

Introduction of Propane and Natural Gas Contracts

The instability of oil prices has led to an increased volatility in other energy prices, which in turn, has forced producers, distributors and consumers of all energy products to seek ways of protecting themselves against unfavorable price movements. In response, NYMEX has prepared a propane contract which commenced trading on August 21, 1987 and a natural gas contract which has been submitted for CFTC approval.

PROPANE CONTRACT:

The propane contract calls for 42,000 U.S. gallons of propane at Mont Belvieu, Texas. Mont Belvieu is known as the center of propane spot trading in the United States. It is the point of origin for the Texas Eastern Transmission Pipeline serving the Midwestern, Eastern and Southeastern states. The Dixie pipeline, serving the Gulf Coast and Southern states, also originates in Mont Belvieu.

One of the important features of the propane contract is its delivery mechanism. Trading of the contract terminates the last business day preceding the delivery month. No later than an hour before trading terminates, all remaining shorts (parties who have sold contracts which have not been offset and therefore obligated to make delivery) must certify to their clearing members that they will have at a bona fide delivery facility the quantity of propane necessary for delivery by the first delivery day. All deliveries are f.o.b. any pipeline, storage or fractionation facility in Mont Belvieu, Texas, with direct access to Texas Eastern Products Pipeline. On the first business day after the termination of trading, all customers are given several hours to arrange an Exchange of Futures for Physicals (EFP) if they so desire. Through an EFP, participants on opposite sides of the market can swap cash and futures and make arrangements for subsequent delivery under circumstances in which all terms (price, location, grade, timing) are fully

negotiable. By 2 P.M. of that day, both the long and short customer (through their clearing members) must file with the Exchange a Petroleum Product Notice. Besides basic customer information (name of the short Clearing Member's customer, number of contracts, tender number of the matched transaction, etc.), the Petroleum Product Notice enables the short Clearing Member's customer to designate the delivery facility and the long Clearing Member's customer to indicate the preferred delivery facilities and preference for a delivery mode (i.e., in storage, book transfer, etc.). While the Exchange's Clearing Department does not guarantee that the long will be assigned to the delivery facility requested, it will make efforts to match parties according to the preferences contained in the Petroleum Product Notice. On the second business day of the delivery month the Exchange will inform each long and short Clearing Member who will be on the other side of the delivery and which delivery facility has been designated. As soon as possible, but not later than the fourth business day of the delivery month, the long must inform the short (and confirm in writing) of the precise details of the delivery (name, number of contracts, etc.) and most importantly, the ten day window in which delivery is to be made.

All movement of propane (physical or otherwise) must take place in the designated window, and windows can only be designated from the tenth calendar day until two business days before the end of the delivery month. Prior to informing the short of the details, the long must contact the scheduler at the designated facility and ensure that the facility can accommodate the delivery request. In a pump-over or inter-facility transfer, the short provides the long with the final details of the delivery, including the date and approximate time the pump-over will begin. This must be done at least three days prior to the initiation of the pump-over and the Exchange must be given a copy of the instructions.

NATURAL GAS CONTRACT:

Consideration of a natural gas futures contract began in 1983 when it became clear that certain categories of natural gas would be deregulated on January 1, 1985. On this date, well-head prices for most new gas--drilled on or after February 19, 1977--were removed from price control thus affecting an estimated 60% of available natural gas supplies. The early NYMEX proposed contract was based on the intrastate market in Texas since the state has the greatest gas production and consumption in the U.S. The intrastate market was selected because, in 1984, interstate transportation service was not widely available. After the FERC issued the Order 436 program in October 1985 and the interstate market became more accessible, NYMEX modified its proposal. In the new version of the contract, Katy, Texas (southwest of Houston) was selected as the delivery location largely due to the proximity of interstate and intrastate pipeline interconnections and access to

most Texas supply and consumption areas.

In 1986 and 1987, the Exchange continued to refine its proposed contract and worked with pipelines in the Katy, Texas area to develop a mechanism through which deliveries could be carried out under the futures contract. These efforts resulted in the creation of the Katy Interchange Service which will provide delivery service for futures and cash transactions through access to the Katy area facilities of the following pipelines: Transcontinental Gas Pipe Line Corp., Trunkline Gas Co., Coronado Transmission Co., and Yankee Pipeline Co. Interchange service will begin when natural gas enters a designated point within the Interchange and will end when gas is delivered through the final outgoing Interchange point. Yankee Pipeline Co. has been selected by the participants to serve as the operator of the Katy Interchange and will coordinate the transfer of gas through the Interchange. The seller is responsible for transporting the gas to the Interchange; the buyer has responsibility for arranging transportation from the outgoing point of the Interchange. On December 9, 1987, the above pipeline participants jointly filed an application with the FERC to establish the Katy Interchange Service.

The NYMEX natural gas futures contract which is being filed with the CFTC is expected to include the following specifications. These contract rules are subject to amendment before formal approval by the CFTC.

Trading Unit:	10,000 MMBtu. Delivery tolerance of 2% above or below contract unit.
Delivery Location:	Katy, Texas
Quality Specifications:	Interchange Service in effect at the time of delivery.
Delivery Months:	Such months as shall be determined by the Exchange Board of Directors.
Minimum Fluctuations:	$.001 per MMBtu ($10 per contract).
Price Limits:	$.10 per MMBtu ($1,000 per contract). No maximum limit on the nearby (spot) contract.
Termination of Trading:	On the third business day prior to the twenty fifth calendar day of the month preceding the delivery month.

CHAPTER 8

PETROLEUM OPTIONS TRADING

Introduction

Although petroleum futures, and in particular crude oil contracts, provide powerful instruments for managing the risk associated with price fluctuations, there are at least two areas in which further flexibility is desired. First, futures contracts extend over a fairly short period of time; trading is normally active only for contracts of up to six month maturity. Second, hedging with a futures contract involves committing to a fixed price regardless of forthcoming events in the market. Options trading provides a bit of more flexibility, in particular in the second area. Options can be used independently or in conjunction with futures contracts providing a wide range of possibilities for managing risk in petroleum trading.

Option trading, in a general sense, dates back to the 17th Century, when the Dutch used options in the notorious tulip bulb craze. Tulip merchants bought promises of delivery from the growers to protect themselves against fluctuating prices. This would obligate the farmer to sell the tulips at a predetermined price but would not obligate the merchant to buy the tulips. For the merchant, the arrangement provided a right to buy for which he would pay a premium. If the price of tulips declined, the option would be worthless, but the tulips could then be purchased in the marketplace at a lower price.

The modern day option trading has also existed for decades in over-the-counter market for many stocks in the United States. However, before 1973, options had not been standardized. The exercise price was usually set at the current market price and the option period was typically three, six, or nine months. So at any time and on any stock, the previously traded options made up numerous expiration dates and a wide range of exercise prices. This meant that, for all practical purposes, the original market makers were the only potential buyers in a rather makeshift secondary options market. There was not much opportunity for reselling the options. In April 1973, all this changed when the Chicago Board Options Exchange (CBOE) came into existence with its new "standardized" options and was soon followed by the American, Pacific and Philadelphia stock exchanges.

Over time, option trading expanded to cover a wide variety of stocks and also of futures contracts. In the case of petroleum, the need for option trading emerged with an increasing volatility of the spot price. This triggered initially some companies, including Morgan Stanley, Philbro and

Standard Oil to offer their own tailor-made options during 1985-86. The formal trading of petroleum options started on November 14, 1986 when NYMEX introduced its option on crude oil futures. This action was then followed by the opening of an option on heating oil futures in June 1987.

Mechanics of Option Trading

The first step towards understanding the working of option trading is to become familiar with the jargons--calls, puts, premiums, strike price, etc. In any option trading, one side reserves the right (with no obligation) to transact the business while the other side accepts the obligation to transact the business if asked to. The person who reserves the right is the buyer of the option; the person who accepts the obligation is the writer of the option. The buyer of the option should, of course, pay a premium for reserving the right for doing the business while the writer of the option receives that premium in return for committing himself to the business transaction. The business, itself, can be a purchase or a sale of a commodity, a stock or a futures contract. Thus the buyer of an option can be buying the right to purchase or the right to sell. What he is buying is the "right" to transact the deal. When he reserves a right to purchase, he is said to buy a "call option". On the other hand, when he reserves the right to sell he is said to buy a "put option". For each of these options, there should be an "option writer", i.e., the person who accepts the obligation (to sell or to purchase) in exchange for a premium. To avoid the normal confusions, one should note that call options and put options are not complementary; your buying of a call option does not necessitate transacting a put option on behalf of the other side of the deal. When you buy a call option, the other side "writes" the call option. That is, you buy the right to purchase and he sells this right. You are in fact paying a premium to acquire a special privilege: if price goes up you benefit by exercising your option and buying the contract at a prior fixed price; if price drops, you will not lose because you do not have to buy--you just let the option expire. So for you, the only cost is the premium you have paid; whatever the market does, you either gain something or lose nothing. The writer of the call option receives the premium to put himself in an especially disadvantaged position: if the price goes up, he will lose because he has to sell the underlying stock or futures to you at a prior fixed price; if the price drops, he will not gain because you will not be buying the stock any longer. So, for him, the only gain is the premium he has received; whatever the market does, he either loses something or wins nothing. If the option writer actually owns the underlying stock or futures, it is called a "covered" write. Otherwise, it is called a naked write to emphasize the added exposure of being called to deliver the stock or futures. The naked option writer is similar to the short seller in the futures market in the sense that they both are selling something that they do not own.

Speaking of similarities between futures and options, it is also useful to note the contrasts between the two methods. If you engage in the futures markets your transaction falls into one of the two categories: (1) you are purchasing a commodity for future delivery; or (2) you are selling a commodity for future delivery. However, if you engage in option trading your transaction could be in one of the four categories: (1) you are buying a right to purchase the commodity (buyer of a call option); (2) you are selling the obligation to sell the commodity (the writer of a call option); (3) you are buying the right to sell a commodity (buyer of a put option); or (4) you are selling the obligation to buy a commodity (seller of a put option). But it is important to note that for each transaction you have only two parties involved. Each transaction is either a trade between (1) and (2) or a trade between (3) and (4). In other words, a call option is a totally independent transaction than a put option and neither of the two needs to be done in conjunction with the other. Indeed, most option transactions are call options and there are normally a smaller number of put options traded on stock or futures exchanges of the United States.

The next step in comparing options trading with futures contracts is to contrast their loss and profit mechanisms. We recall that the commitments involved in a futures contract are symmetrical for the buyer and the seller who have to meet their commitments even when it is not profitable for them to do so. In contrast, an option buyer will only exercise his right when it is profitable for him to do so and, then, the option writer has no choice but to meet his obligation. Thus, the premium paid by the buyer of an option contract is to compensate for the asymmetry between the buyer's rights and the seller's obligations.

For example, a trader purchases a call option for the August crude at $16.00 per barrel. He will pay, let us say, $0.50/barrel as premium to reserve the right to buy this contract. If the price of the contract rises to $18 per barrel, he would exercise the option and make $2.00 per barrel gross profit on the contract. From this gross profit, we should deduct $0.50 per barrel to arrive at the net profit of $1.50 per barrel for this trader. The writer (seller) of the option would lose $2.00 per barrel on the contract but has received $0.50 as premium, so his net loss will be $1.50 per barrel.

Now let us assume that after the purchase of the call option, the August crude contract falls to $14.00 per barrel. Obviously, the purchaser of the call option will not exercise his option and let it expire, because he can buy crude on the spot market at a lower price than $16.00 which is the strike price of his option. Thus, his loss is limited to $0.50 per barrel (the premium he had paid) while the price has actually declined by $2.00. The writer (seller) of the option will gain only $0.50 per barrel--the pre-

mium he received when selling the option. In summary, the purchaser of this call option will exercise his option only if the August crude trades above $16 per barrel. In case it does, his net profit will be the gross profit minus the premium of $0.50. Thus, he will be making a net profit only if price exceeds $16.50. The seller of the option would have to deliver his obligation only when the buyer wants him to, i.e. when the price is above $16.00 and the seller is bound to lose because of the delivery. Thus, at a price above $16.00, the buyer profits and the seller loses; there is no limit to this gain and loss. At a price below $16.00, the buyer does not lose more than the premium he has paid and the seller will not gain more than that premium.

The main difference between the reward systems of future contracts and option trading is in the structure of price risk for sellers and buyers of contracts. In the case of a futures contract, both the buyer and the seller can have unlimited gain or loss depending on price variations. In the case of options, the buyer has the possibility of unlimited gain but his loss can not exceed the paid premium. The seller faces the possibility of unlimited loss but his gain can not exceed the premium. It may sound that the buyer of an option is in a better position and we may wonder why some people would want to be option sellers. This is clearly not true. What more or less equalizes, at least in a probablistic sense, the positions of buyers and sellers is the size of the premium.

What Factors Determine the Size of the Premium?

In general, the premium that a purchaser of, let us say a call option, is willing to pay depends on his judgment about the possibility and the extent that the price of the underlying stock or commodity moves above the strike price of the option. More specifically, the premium depends on:

- the difference between the strike price of the option and the current price of the stock or commodity;
- the expected volatility of the price of the stock or commodity;
- the time of expiration of the option; and
- the level of risk-free interest rates.

The first factor, the difference between the current price of a futures contract and the strike price of the option on that contract, represents the minimum premium for an option. It indicates the relative position of your bet. For example, if you are buying a call option with a strike price of $14 per barrel for an August crude oil futures contract while the current

price of the August crude contract is $16.00, your bet is very favorably positioned. You are reserving the right to buy the August contract at $14.00 at any instant from now till the expiration date of the option. The difference between $16.00 and $14.00 is referred to as the "intrinsic value" and represents the minimum premium for the option because you can receive this minimum value immediately. That is, you can decide to exercise your option immediately which means you buy an August crude oil futures contract at the price of $14.00 per barrel while the current price of the same contract is $16.00. If you decide not to exercise the option now, it is because you expect that prices will further go up and your option will be worth more than $2 per barrel some time in the future but before the expiration date of the option contract.

The second factor, price volatility, is the main incentive for option trading; with no price volatility, option trading would cease to exist. The greater the volatility, the greater the probable price range in the future. With a wider price range, the option buyer is more likely to profit and the option writer is more likely to lose. Therefore, there is a direct relationship between the option premium and the volatility of the price of the underlying commodity. We recall from our discussion of futures contract that price volatility was essential also for futures trading. There is, however, a fundamental difference between the impact of price volatility on futures trading and on the option trading. In the case of futures contracts price, fluctuation represents a risk for both sides of the trade. In a market with wide range of price fluctuation, both the buyer and the seller of a futures contract take a risk by committing to delivery of the commodity at a fixed price because, by the time of delivery, the market price may be substantially higher or lower than the fixed price agreed under a futures contract. In the case of an option contract, price volatility represents only a benefit to the purchaser and only a risk to the seller. If the market price fluctuates extensively and frequently, it is likely to hit a level favorable to the purchaser of the option at which he would immediately exercise the option and make a profit. With such fluctuations, the price is also likely to hit a level unfavorable to the buyer but he would not exercise the option. In short, price volatility plays a more important role in option trading than in futures trading because the reward system of the former is not symmetric. Because of the same reason, price volatility directly impacts the size of option premiums.

The third factor affecting the size of an option premium, i.e., the time-to-expiration, also increases the probability that the market price would hit a level favorable to the buyer of the option. For example, we compare two call options--both on the same commodity, let us say, crude oil futures, and both with the same strike price, let us say, $18.00 per barrel. The only difference is that the first option will expire in one month time and

the second option in two months. In the case of the first option, the buyer will profit if price exceeds $18.00 at any instance during the next 30 days while in the case of the second option, the buyer has the same opportunity, but lasting for two months. Clearly, the second option offers a better profit potential and is worth more than the first option. Thus, other things being equal, the longer the period to the date of an option expiration, the larger is the size of its premium. Because of the same reason, the market value of an option contract (i.e. the premium) declines very rapidly as the option approaches its maturity. If the option is not exercised by the date of maturity, its value becomes zero.

The fourth factor, i.e., risk-free interest rate, is less important than other factors in determining option premiums. The idea here is that when people buy options, they are indeed putting their capital in this use and thus giving up other investments. Risk-free interest rate is then used as an indication of the return on the alternative investment (opportunity cost). When interest rates change, people would alter their demand for option contracts and thereby the option premium is affected.

The above four factors affect the size of option premiums in a rather clear manner. A mathematical model introduced by Black and Scholes quantifies the relationship between the size of the premium and the strike price, the market price, the time to maturity, the interest rate and price volatility (measured by the variance of percentage change in price). The actual option premium is, of course, determined through the interactions of bids and offers on the pertinent exchange, but the Black and Scholes formula provides an estimate of a "fair premium". This may be viewed as equilibrium premium which would equalize the return prospects, as estimated at the time of the trade, for both sides of an option contract. The Black-Scholes model is used for stock option pricing. A variation of this model, called the Black Model, along with several modified versions of it, are used in pricing options on futures.

The main difficulty in estimating an option premium is assessment of market volatility. Simply defined, volatility represents the degree to which the underlying futures contract is likely to fluctuate--in either direction. It is measured by taking the standard deviation of daily price relatives--today's price relative to yesterday's price. However, there are two ways to calculate volatility: on a historical basis or on an implied basis.

Historical volatility is that which is actually observed in the marketplace, most commonly over a 10, 20, or 30-day period. This is a deductive means of calculating market volatility. Implied volatility is an inductive method. It backs out the volatility of the underlying futures contract from the market traded option premium. Implied volatility is a barometer

of expectations for the future rather than a measure of what has happened in the past. Estimations of future volatility can change erratically over short periods of time. Prior to the December 1987 OPEC meeting, for example, the implied volatility in crude oil jumped from a low of 15% to a high of 46% over only a couple of months. In general, implied volatility in the oil market has peaked with new price lows, indicating a clear bearish bias in the market.

Implied volatility is helpful in evaluating whether a particular option is fairly priced, overpriced, or underpriced in relation to other options or to other hedging alternatives. For example, if call options are pricing a significant increase in market volatility, their premiums may fall while underlying prices remain unchanged, should volatility estimates suddenly drop. This can be seen by examining the premiums for each of three levels of implied volatility in Table 8.1. The potential sensitivity of option premiums to changing estimates of market volatility is clear.

Pricing models such as Black assume that options will not be exercised prior to expiration. Of course, few option traders actually do so, owing to timing mismatches, time decay, and short-term profit opportunities. Thus, a common derivation of the Black Model measures something called the delta.

Table 8.1: IMPLIED VOLATILITY AND PREMIUM FOR HEATING OIL OPTIONS

Strike $	Implied volatility %	$.43 Option premium	Delta %	$.44 Option premium	Delta %	$.45 Option premium	Delta %
	25	.0179	64	.0248	75	.0327	84
.42	30	.0202	62	.0269	72	.0344	80
	35	.0226	61	.0291	69	.0363	77
	25	.0082	39	.0127	51	.0184	63
.44	30	.0106	41	.0152	52	.0209	62
	35	.0131	43	.0178	52	.0234	61
	25	.0031	19	.0054	28	.0088	40
.46	30	.0049	23	.0076	32	.0113	42
	35	.0069	27	.0099	35	.0138	43

Source: Kay (1988).

Delta measures the sensitivity of option premiums to changes in underlying futures prices. Delta also represents the probability that a given option will have value at expiration, given current market prices and expectations about volatility. As such, delta is dynamic--it changes with any change in market prices or expectations.

Delta values range from 0 for deep-out-of-the-money options to 1.0 for deep-in-the-money bullish positions and--1.0 for deep-out-of-the-money bearish positions. At-the-money options ordinarily have a delta of about plus (long calls) or minus (long puts) .5. To illustrate: a call option with a delta of .5 should move up $.05 for a $.10 upward move in the underlying futures contract. Deep-in-the-money options behave a lot like futures contracts, since they are almost certain to have value at expiration. Options which are deep-out-of-the-money show little or no response to movements in the underlying futures contract, since there is very little chance that they will have value at expiration, regardless of what futures prices do. Table 8.2 assumes an implied volatility of 25% and 31 days until option expiration. For a long option, call deltas are positive and put deltas are negative. As a call option moves further into-the-money, its delta increases until it eventually approaches 1.0. Meanwhile, a long put option's delta

gets more negative as the option moves further into-the-money, until it eventually approaches--1.0.

Deltas for short option positions work in reverse. A short call's delta gets increasingly negative as the option moves further into-the-money. And a short put's delta gets higher as the put moves further into-the-money.

Table 8.2: VALUE OF DELTA FOR LONG HEATING OIL OPTIONS

Futures Price	$.43	$.44	$.45
Buy $.44 Call	+.41	+.52	+.62
Buy $.44 Put	-.61	-.49	-.37

Source: Kay (1988).

We can combine two concepts to show the effect of changes in implied volatility on options deltas. While an increase in volatility has only a minor effect on at-the-money option deltas, it significantly increases out-of-the-money deltas and significantly decreases in-the-money deltas. Higher volatility increases the change that out-of-the-money options will expire in-the-money, and vice-versa.

Aside from its value for short-term trading, delta is a useful concept for the option hedger as well. By adding up option deltas, it is possible to construct an equivalent net futures position. The net delta measures the degree of hedge coverage afforded by a particular combination of option positions at any given moment. By adding or subtracting additional options to the original position and calculating their effect in terms of net futures equivalent, a hedger can continuously adjust risk/reward profiles in line with changing management objectives. In Table 8.3, a total of seven options have been combined to form the equivalent of one short futures position. These option positions would provide the same degree of price protection as would selling one futures contract. In most cases, this degree of price protection could better be gained by going into the futures market. However, options provide more flexibility when dynamic hedging, rather than complete price protection, is the objective.

Table 8.3: EQUIVALENT NET FUTURES POSITION OR NET DELTA
Example: October Heating Oil Futures @ $.44

Option Position	Delta	Net Delta
Long 2 $.44 calls	+.52	+1.04
Long 3 $.44 Puts	-.49	-1.47
Long 2 $.46 Calls	-.28	-.56
Total Net Delta	-.99	

Source: Kay (1988).

Participants in Petroleum Option Trading

A market survey carried out in 1987 indicates that participants in the crude oil options include: eight integrated oil companies, four refiners, six trader-resellers and 25 traders.

Like those of the futures markets, participants in option trading are hedgers and speculators, though the distinction between the two is not always easy. A hedger may use option trading to limit his losses in case price moves unfavorably. For example, a refiner who would need to buy 100,000 barrels of crude in two months may buy a call option at a desirable strike price. If the spot price moves above the strike price he would exercise his option and purchase the crude through his option contract at the strike price. If the spot price drops below the strike price, he will buy his crude in the spot market, letting his option expire; he would, of course, lose the premium paid for the option.

Similarly, a trader with long cash heating oil position (a trader who owns heating oil) can fix a minimum sale price by buying put options. If prices decline, the trader is hedged because he had already contracted the right to sell. If prices rally, the most the hedge will cost is the premium paid. Appreciation in the value of his inventory will offset some or all of the fixed cost of the hedge beyond which the trader can enjoy the benefit of higher selling prices in the spot market. Thus, the buy put strategy provides the trader downside protection without jeopardizing the trader's potential for profit when prices rally.

The hedging function is similar to the one carried out through a futures contract with one major difference. In the case of futures market, if the hedge works well (spot futures prices move together), the hedger will protect himself against the risk of unfavorable price movements while he would also give up the potential profit from favorable price movements. In the case of options, the hedger will protect himself against unfavorable price variations but still may benefit from unexpectedly favorable price movements. That is, he transfers the risk to the buying agent but still keeps some of the profit potential for himself. This is a more desirable hedging arrangement than is provided by the futures market. The hedger, of course, pays a price--the option premium--for this more desirable hedging arrangement.

Hedging through options is also more flexible than hedging through the futures market. For example, our aforementioned refiner may want to take a hedging policy of limiting losses only if price movement is very unfavorable--let us say a surge beyond $20.00 per barrel due to some political event. He will then buy a call option with a strike price of $20.00 which would carry a small premium. The point is, with options the hedger can choose the range of price he wants to avoid and select the appropriate option, combination of futures and options or combination of various options to achieve this goal. With options, a hedger can buy price insurance at a fixed cost (premium) to protect against adverse price movements without foregoing the potential to profit from favorable price movements. Further, he can choose the extent or coverage of the insurance and take the appropriate policy.

For speculators, option trading may provide an ideal tool. A speculator anticipating an increase in the price of oil would buy a call option. If the price does actually go up, he will profit as much as he would with a futures contract, minus the option premium. If the price drops, his loss will be limited to the premium paid for the option. A put option would serve a similar function for a speculator who anticipates a fall in the price. Quite often speculators limit their potential loss to even less than the option premium by combining options and futures or combining various options. As one moves towards more sophisticated methods and strategies, the management of the positions becomes more complicated, premiums and transaction costs go up and it would be harder to say who hedges and who speculates. What comes with this sophistication is flexibility and a wide range of methods to manage risk portfolios.

Hedging with Petroleum Options 1/

In most hedging strategies, the hedge is designed to protect profits or asset values, or establish costs or revenues at favorable price levels. The subsequent market action affects cash flow, not final cost. In a "fully hedged" approach, the objectives are set, the hedge ratio calculated, and the position implemented. Only when the cash transaction is executed is the offsetting hedge lifted. The use of futures permits the attainment of objectives not always available in the physical market, and the introduction of option strategies broadens considerably the range of goals achievable within either the physicals or futures markets.

To design options-related strategy, three major issues must be considered and resolved:

- o What is the objective of the risk manager (hedger)?
- o What is the hedger's opinion or forecast for the related market during the hedging period?
- o What has been the volatility of the underlying futures market, and what is it expected to be during the hedging term?

Based on these considerations, the hedging objectives will be set. On the producers' side, these objectives may include:

- locking in favorable prices for forward periods;
- protecting the value of existing inventories or future production at current values;
- setting a minimum price for future sales, yet participating if prices rise; and
- enhancing revenue by collecting a premium for accepting the obligation to sell product above the current market.

The first two objectives can be achieved using physicals or futures, but the last two require options techniques. On the consumers' side, the objectives of hedging may include:

1/ Based on examples worked out by Leiffer and Harwitt (1988), Colburn (1988) and Kaplan and Beutel (1988).

- locking in favorable costs for forward periods;

- protecting the value of raw materials purchased, goods-in-process, or finished goods at current values;

- setting a maximum price for forward purchases,while benefiting if prices fall; and

- developing the potential to buy below current market and collecting a premium to do so.

Again, the last two objectives incorporate option strategies rather than futures alone.

Although the use of futures strategies may not demand a market forecast, the choice of an appropriate options strategy requires some appraisal of likely market ranges over the hedge period.

- a strongly bullish forecast would suggest buying futures, buying calls, or writing (selling) puts;

- a strongly bearish forecast would suggest selling futures, buying puts, or writing (selling) calls;

- a moderately bullish strategy would suggest buying calls;

- an expectation of a narrow trading range with declining volatility might suggest writing both puts and calls; and

- a directionless forecast with rising volatility might suggest buying puts and calls.

With the available futures and options instruments, one can design a wide range of hedging strategies. The following cases are a few examples of certain strategies that can be pursued on the production/distribution side, as well as, on the consumption side.

As an example of the use of options on the supply side, let us assume that, on October 1, a heating oil distributor has finalized contract with a municipality to deliver heating oil at a guaranteed maximum price of $0.48 per gallon. The deliveries will occur in January. If prices rise between October and January, the distributor, if unhedged, would be forced to absorb the higher costs. The distributor, however, may be reluctant to simply buy calls to protect against a rising market. A buyer of a call option has the right but not the obligation to buy futures at a specific price during the

life of the option. Although the risk of a long call position is limited to its purchase price, this cost may seem excessive to the distributor should prices drop.

One strategy to reduce this initial cost is a three-part options spread-designed to accommodate the distributor's forecast range of heating oil-prices through the early winter. The approach is to combine buying and selling of February options at three different strike prices such that the net cost of the option spread is near zero. Specifically:

- Sell a put at a strike price near the bottom of the expected trading range.
- Buy a call at a strike price near current futures price levels.
- Sell a call at a strike price near the top of the expected trading range.

Note that the seller of a put expects the market not to fall below the strike price of the put option; the seller of a call expects the market not to trade above the strike price of the call option. If these forecasts prove valid, the seller of these options simply earns the premium originally collected.

Assumptions underlying this example are:

- On October 1st, February heating oil futures = $.47/gallon.
- Distributor's marketview: heating oil prices could fluctuate between $.42-$.50/gallon through early January.
- Heating oil cash and future prices move in tandem.

The strategy is:

- Buy February $.48 call at $.0200/gal.
- Sell February $.50 call at $.0135/gal.
- Sell February $.42 put at $.0065/gal.

Net Cost = zero

All options expire January 13; option prices assume a volatility of 25% on October 1.

The profit/loss results of the hedge are:

Table 8.4: PROFIT/LOSS OUTCOME OF A HEATING OIL HEDGE PROGRAM (per gallon)

No. 2 oil cash prices	Physical sales price	Gain or loss (physical)	Gain or loss (short 42 put)	Gain or loss (long 48 call)	Gain or loss (short 50 call)	Total profit (loss)
$.40	$.48*	$ .08	$(.02)	$___	$ ___	$ .06
.42	.48*	.06	___	___	___	.06
.44	.48*	.04	___	___	___	.04
.46	.48*	___	___	___	___	.02
.48	.48	___	___	___	___	0
.50	.48	(.02)	___	.02	___	0
.52	.48	(.04)	___	.04	(.02)	(.02)

Source: Kaplan and Beutel (1988).

Note that with this hedge strategy, the distributor has significant flexibility. If cash prices fall, he has the ability to offer low prices to his customers down to $.42 per gallon without losing money on his hedge. Below $.42, the short $.42 put behaves like a long futures position, losing value tick for tick as heating oil prices fall. In this situation, the distributor will need to offset the loss on his hedge by maintaining his sales prices in the physical market.

If prices rally, the distributor will earn a profit on his long $.48 call position up to $.50 per gallon. Should prices continue to rally above $.50 per gallon, the distributor's profit on his hedge is fixed since the gain from the long $.48 call will be offset by the loss from the $.50 call. However, if the distributor believes that $.50 per gallon will be the maximum price during the winter, he is likely to realize full profit participation from the call spread.

As an example of hedging on the demand side, let us assume that an end user needs to hedge against possible increases in the price of heating oil by the time he would need to purchase and consume the oil. He can buy heating oil futures contracts at $0.45 per gallon. If he uses the futures market for

hedging, a net price of $0.45 will be received regardless of how dramatically prices change. However, with options, he would have a different risk-reward profile. Buy call strategies provide protection against an upward move in prices but allow participation in a downward price move. For example, the end user buys a December $.46 call option for $.0240 per gallon. It has established a maximum purchase price at $.4840 per gallon, because the long call conveys the right to buy futures at $.46 with a cost of $.0240 ($.4600 + .0240 = $.4840). If prices rally above $.46, the company can exercise the call option. The flexibility of the long call strategy is illustrated when prices decline. If prices drop to $.42 per gallon, the end user has a net purchase price of $.4440 after accounting for the cost of the hedge, $.0240. Because the cost of the hedge is fixed at $.0240 (the premium), the oil company is able to participate in market-declines. Compared with the futures hedge, the buy call strategy is superior when prices decline. At $.50, the futures hedge achieves a net purchase price of $.4541, while the $.46 call achieves a price of $.4840. The futures hedge is superior if prices rally or if prices remain unchanged. If prices remain unchanged at $.4541, the futures hedger pays $.4541 for oil; the option trader receives $.4541 plus the premium paid, $.0240, or $.4781.

Trading different strike prices also alter the risk reward profile of the hedger. For example, the $.46 call establishes a $.4840 ceiling, lower than the $.4975 ceiling established by the $.48 call, and lower than the $.5125 maximum purchase price established by the $.50 call. However, the best protection against an upside move costs the most. The premium for the $.46 is $.0240, while the $.48 and $.50 calls cost $.0175 and $.012, respectively. The cost of the option determines how much the hedger participates in a down ward move in prices. With prices at $.38 at expiration, the hedger who has purchased the $.46 call pays a price of $.4040, higher than the $.3975 and the $.3925 for the hedger who purchased the $.48 or $.50 call, respectively.

Table 8.5: HEDGING RESULTS USING FUTURES AND OPTIONS

		Net Purchase Price ($/gal)						
Futures at expiration	Futures hedge	Buy calls $.46	Buy calls $.48	Buy calls $.50	Sell puts $.44	Sell puts $.42	Sell puts $.40	Fence B$46C S$44P
$.52	$.4541	.4840	$.4975	.5125	.5010	$.5085	.5130	.4650
.50	.4541	.4840	.4975	.5125	.4810	.4885	.4930	.4650
.48	.4541	.4840	.4975	.4925	.4610	.4685	.4730	.4650
.46	.4541	.4840	.4775	.4725	.4410	.4485	.4530	.4650
.44	.4541	.4640	.4575	.4525	.4210	.4285	.4330	.4450
.42	.4541	.4440	.4375	.4325	.4210	.4085	.4130	.4450
.40	.4541	.4240	.4175	.4125	.4210	.4085	.3930	.4450
.38	.4541	.4040	.3975	.3925	.4210	.4085	.3930	.4450
Net debit	(.0240)	(.0175)	(.0125)		(.0050)			
Net credit			.0190	.0115	.0070			

Source: Colburn (1988).

If an end user has the flexibility to withstand some increase in oil prices, a sell put strategy may be appropriate. By selling puts the oil company takes advantage of high premiums and expects sideways trading markets. The premium received from selling the puts acts as a hedge against rising prices. However, protection is limited to the premium received. If prices decline, the company participates until prices reach the put's strike price. Losses on the short put then begin to offset gains on the cash position.

Net sales prices for three short put strategies are illustrated in the table of hedging results. By selling $.42 puts, the company buys heating oil for $.0115 below the market price if prices remain above $.42. Otherwise if prices move lower, the hedger pays $.4085, or the strike price minus the premium. Selling $.42 puts against a short cash position brings in less cash than the short $.40 put strategy. This implies that the $.40 put is not as effective as a hedge against higher prices as is the $.42 put. The tradeoff is that the short $.40 call allows for more participation if prices move lower. The least price the hedger can buy heating oil using the $.40 strategy is $.3930, $.0055 lower than the $.42 short put hedge. Selling the $.40 call takes in the least amount of premium, but allows for the most downside participation of the three sell put strategies.

A hedger may like the idea of establishing a floor or ceiling price through buy call strategies but may feel that premiums are too expensive. The hedger could sell out of the money puts and use the premium received to offset the cost of the calls. This strategy is called a "collar-or-a-fence." In our example, the hedger sells $.44 puts to offset the cost of buying $.46 calls. The puts are sold for $.0190 and the calls are bought for $.0240, a net debit of $.0050 per gallon. The maximum purchase price is established at $.4650. If prices go above $.46, the hedger exercises the option to buy at $.46 and has paid $.0050 premium upfront.

Reducing the cash cost of a call by selling a put is not done without some tradeoff. In this case, the hedger is giving up any downside participation below $.44. If prices go below $.44 gains made on the short cash position are offset by losses on the short put position. For example, at $.38, the hedger buys heating oil for $.38 but loses $.06 on the short $.46 put. The hedger paid $.0050 up front, so the net purchase price is $.4450.

Fences are effective hedging strategies for oil companies that need to establish maximum purchase prices and yet would like to participate in a down market. Floors and ceilings can be adjusted to reflect the amount of downside protection needed, the level of upside participation and the amount of cash paid or received up front. The fence allows the hedger to remove extreme volatility in price movements at low cost.

Examples of Volume of Option Trading

The NYMEX crude oil options have become the second most actively-traded commodity option, trailing only the Treasury bond option contract traded on the Chicago Board of Trade. The trading volume of crude oil option averaged 10,000 contracts per day in 1987. By the second half of the year, the trading volume increased to over 15,000 contracts a day and on August 20, it hit a record high of 44,992 contracts. The number of contracts averaged around 25,000 per day in the first half of 1988. Open interest in crude oil options has already climbed to 200,000 contracts.

Acceptance of crude oil options by the oil industry has been quite rapid. In contrast to petroleum futures contracts, which took some time after their introduction to be taken seriously by the oil industry, option trading grew rapidly shortly after their commencement. There are at least two major reasons behind this rapid growth. First, extensive volatility of petroleum prices in 1986-87 has provided the right condition for option trading. In particular, many hedging positions on the futures market have now turned into a combination of futures and option contracts. Secondly, option trading was introduced after a relatively long period of time that the oil

industry took to digest petroleum futures. When options arrived, the petroleum industry was already active in the futures market and viewed the option contract as simply one more instrument of risk management.

Heating oil options have grown at a much slower pace. The average volume reached about 500 contracts per day in early 1988 and has remained at this level.

Finally, NYMEX has received approval from CFTC in December 1987 for an option contract on unleaded gasoline. As an option on the underlying futures contract, specifications for unleaded gasoline option will parallel the futures contract. Options for six consecutive months would be traded. Strike prices would be in increments of 2 cents per gallon and seven strike prices would be available at all times.

Glossary Of Terms

Actuals	The physical or cash commodity.
Arbitrage	The simultaneous purchase and sale of different contracts to profit from an expected change in the price differentials between them. The contracts can be for different commodities, for the same commodity in different locations, or for the same commodity at the same location but for different months.
Backwardation	When the price of a good for later delivery stands below the price of the good for earlier delivery. That is, nearby futures trade at a premium to the more distant futures.
Basis	Describes a price based on another price. In futures trading, basis is used to show: (1) the difference between the prices of two commodities; (2) the difference between the prices of the same commodity in different locations; or (3) the difference between the prices of the same commodity at the same location but for different delivery months.
Bear	A person who sells with the expectation of a price fall.
Bid	An offer to buy at a stated price.
Broker	A person paid a fee or commission for acting as an agent in making contracts or sales.
Brokerage	A fee charged by a broker for execution of a transaction.
Bull	A person who buys with the expectation of a price rise.
Buying hedge	Buying futures contracts equal to the amount of the cash commodity that is eventually needed.

Cash and carry	The simultaneous purchase of a commodity for cash delivery and sale of the same delivery at a later date.
Cash market	The actual or physical market (spot market).
Carrying charge	The cost to store and ensure the delivery of a physical commodity.
CFTC	Commodity Futures Trading Commission in the US.
Chicago Board of Trade (CBT)	The world's largest futures exchange founded in 1848 in Chicago.
Chicago Mercantile Exchange (CME)	The world's second largest futures exchange founded in 1919 in Chicago.
Clearing-house	A non-profit association that helps its members balance their accounts with one another.
Contango	To gain control of the market to sell at inflated prices.
Crack spread	Simultaneous sale and purchase of crude and products contracts.
Day order	An order that only applies for one trading day.
Day trading	A purchase and sale of the same futures during the trading hours of a single day.
Delivery notice	Notice of a clearing member's intention to deliver a stated quantity of a commodity in settlement of a futures contract.
Deposit	The initial outlay required by a broker to open a futures position.
Differentials	Price differences between qualities and locations of delivery.

Discretionary account	An account for which buying and selling orders are decided by the broker without the prior consent of the client.
First notice day	The first day on which a notice of intention to deliver the actual commodity against a futures contract can be made.
Floor broker	A member who executes orders for the accounts of other members on the trading floor.
Forward contract	An agreement to make and take the delivery of commodity in the future. A forward contract is normally tailored to the particular needs of the contracting parties.
Futures contract	A commitment to make or accept delivery of a specified (standardized) quantity and quality of a commodity during a specific month in the future at a price agreed at the time the commitment was made.
Good till cancelled (GTC)	An open order that remains in force until the client explicitly cancels the order, or until the futures) contract expires.
Hedge	To use the futures market to reduce the price risks associated with buying and selling the actual commodity.
IPE	International Petroleum Exchange formed in 1981 in London for trading petroleum futures contracts.
Inverted market	When the nearby futures trade at a premium to the more distant futures.
Last trading day	The last day for trading a particular delivery.
Limit	The maximum fluctuation that is allowed on certain markets in one trading session.
Limit order	An order to buy or sell at a specified price.
Liquidation	The closing out of a previous position by taking an opposite position in the same contract.

Long	Describes the market position of someone who has purchased something. In futures trading, it refers to the purchase of a futures contract without an offsetting sale.
Long liquidation	The closing of long positions.
Lot	The minimum contract size for a particular commodity.
Margin	A deposit that a client makes with his broker to secure the performance of the futures contract.
Margin call	A broker's request to a client for additional funds to keep his original deposit intact a certain percentage of the contract value.
Market order	An order to buy or sell at the best obtainable price.
NYMEX	Founded in 1872, New York Mercantile Exchange is currently the world's largest petroleum futures market.
Open interest	The number of contracts for futures delivery outstanding at any time, i.e. the number of contracts that have not been cancelled by an offsetting trade.
Pit	The area on an exchange floor where futures trading of a commodity takes place.

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