Energy Markets:
Price Risk Management and Trading

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Introduction

Today, more than ever before, the management of price risk is the center of attention for the majority of energy producers and consumers around the world. Strong demand from the United States and China during the years leading up to 2007 increased geopolitical tensions surrounding energy-producing regions, and increased money flow from traders and fund managers into the energy financial markets has contributed to a combination of increased energy prices and increased volatility.

With over US$100 billion of additional speculative money added to the energy financial markets such as the New York Mercantile Exchange (www.nymex.com) and the Intercontinental Exchange (www.theice.com) between 2000 and 2006, it's fair to say that even if geopolitical tensions do not create any further volatility in the years to come, the increased money flows created by investors into the energy markets may continue to do so. Although investors cannot determine the long-term price trends in energy markets, which are driven by fundamental supply/demand economics, they can determine short-term volatility in price.

The magnitude of the increase in trading in the energy markets is reflected by the phenomenal growth in the daily volumes of the global energy markets. In early 2007, the average daily value of global oil-futures contracts was around US$300 billion notional value, and close to US$800 billion when the over-the-counter (OTC) swaps markets is factored into the equation.

What does this mean for energy-related or energy-dependent businesses? Increased volatility in prices makes it even more difficult to budget properly for revenues or expenses. Admittedly, the relationship between risk and reward is at the heart of all business. In any endeavor, the risk of heavy losses is seen as a justification for handsome returns, while lower-risk enterprises command more modest margins. Perhaps for this reason, the most risky and rewarding businesses are sometimes portrayed as a species of high-stakes casino. But such a comparison is misleading. All successful businesses must learn to assess and manage risk in ways that allow them to exploit opportunities while limiting their exposure to unpredictable factors in their operating environment. The more volatile the market, the more important this process of risk management becomes.

The energy industry and its associated markets certainly experience more than their fair share of volatility. Indeed, historians use the more turbulent incidents in the industry's recent past (the oil price shock of 1973 and the Gulf War of 1991) as key milestones in general economic history. Not to mention the historic and sustained price rise seen in the global oil and gas markets from 2003 to 2006.

So it's no surprise that, over the years, the energy industry has honed risk management into a fine art, although still perhaps not an exact science.

One of the key concepts in this "fine art" is the use of derivatives: financial instruments that derive their value from an underlying asset. Derivatives contracts allow some players in a market to hedge their risks, while others take advantage of the opportunities that such hedging provides. As in other financial markets, the three main tools are futures, options and swaps. A futures contract is a way of agreeing to buy and sell an asset for delivery at a future date, while an option is a contract which confers the right but not the obligation to do so. A swap is an agreement to fix a price in an otherwise floating market.

The idea of using derivatives in the energy market has been around for many years. The first Heating Oil (Gasoil) Futures contracts were traded on the New York Mercantile Exchange in 1979 and the first oil swap was reported in 1986 (between a bank, an oil trader and an Asian airline). But it was the Gulf War of 1991 that really brought the market to life.

The perceived threat to the world's oil supplies posed by Saddam Hussein's invasion of Kuwait in August 1990 caused the price of crude oil to jump by more than 50% in a single month and the markets have never forgotten that brutal lesson. Since then, the continuing tensions in the Middle East, changes in legislation and the ongoing deregulation of economies and markets around the world have introduced more and more businesses to the risks and rewards of the volatile oil, power and gas markets. The result is that the demand for energy derivatives has increased exponentially over recent years.

This book aims to provide practical guidance in the effective trading of energy derivatives and their use as tools of price-risk management.

These are normally considered to be highly specialized activities, but this does not mean that they should be treated in isolation. Energy derivatives cannot be properly understood or used effectively unless they are considered as part of a bigger picture. When a company chooses to control price risk through the use of derivatives it may find that it increases the risks in other areas of its business; for example, it may increase its operational, legal or tax risks. For this reason, this book covers many of the issues and topics surrounding energy-price risk management to ensure that the use of derivatives does not cause any unwanted or unplanned difficulties.

In this book you will find fact, flavor and formulae. Each is a key element in running a successful hedging strategy but must be integrated into the company's management ethos. Therefore, this is a book to be read not just in the trading departments, but also in the boardroom, in the finance department and by shareholders in the enterprise.

Whilst the media make much of derivatives scandals, corporate collapses and hedge-fund closures, there are thousands of success stories for every disaster.

Tom James
Head of Commodity Trading
Liquid Capital Markets Ltd

Liquid Capital Group

The Liquid Capital Group was founded by brothers Chris and Gregg Siepman in 2000 and by 2007 the firm had already grown to more than 130 employees with offices in London, Sydney and Chicago. Liquid Capital ranks amongst the top largest global equity derivatives market-makers by volume on Eurex and other equity option markets. In July 2007 Liquid Capital expanded its business into energy and commodity derivatives trading and investment management.

For more information on the group please visit: www.liquidcapital.com

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CHAPTER 1

Risk Management in Energy Markets

In most financial markets there are a fairly small number of fundamental price drivers which can be easily translated into pricing and risk-management models. In currency markets, for example, the commodity that has to be delivered is cash, a piece of paper which is easily stored, transferred and not sensitive to weather conditions.

But energy markets are concerned with bulky, dangerous commodities that have to be transported over vast distances, often through some of the most politically unstable regions of the world. This means that there are a large number of factors that can affect energy prices. A fairly short list of such factors might include the weather; the balance of supply and demand; political tensions; comments made by the leaders of certain countries; decisions taken by OPEC; analysts' reports; shipping problems; and changes to tax and legal systems. All of these contribute to the high levels of volatility in energy markets, which often experience sudden price movements from one day to the next, or even from one minute to the next.

THE RISK MATRIX

One way of understanding how these factors combine to influence energy prices is to use the risk matrix shown in Figure 1.1. This illustrates how all the risks shown interrelate and affect one another, and makes clear that the relationships between them are never two-dimensional. It also makes the point that it is impossible to manage price risk effectively without reviewing all the other risks that an individual or a firm may face.

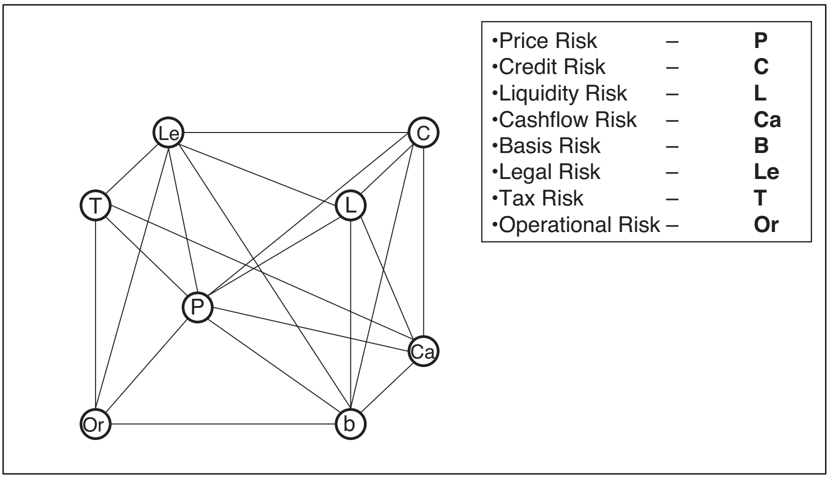

FIGURE 1.1 The Risk Matrix

As the matrix shows, the key additional risks to be managed in an organization when using derivatives for trading or price-risk management purposes are credit risk, liquidity risk, cash-flow risk, basis risk, legal risk, tax risk and operational risk. All these risks will have a direct bearing on which derivatives are employed and the choice of trading partner. They will also affect decisions on where trading takes place (which is dependent on jurisdiction and tax risk) and how much is traded (which will depend on operational risks).

FINANCIAL RISKS

- ### Price risk

This is the risk of losing money as a result of price movements in the energy markets and is sometimes referred to as "market risk". Typically, producers will lose money when prices fall, while users will find themselves out of pocket when prices increase.

- ### Credit risk

Credit risk is the risk of financial losses arising when the counterparty to a contract defaults. It is often said that a hedge contract is only as reliable as the credit standing of the counterparty and credit-risk management has moved to the top of the priority list for the energy industry. The credit crunch felt in the U.S. energy sector in the aftermath of the Enron disaster has prompted energy traders to review credit policies and also to review effective methods to control and reduce credit risk wherever possible.

- **Liquidity risk**

In the context of this book, this is the risk of losses caused by a derivatives market becoming illiquid. This happened during the Gulf War when there was so much volatility in the markets that many banks and oil traders would not give a bid or offer price. Companies who were exposed to those markets at the time were sometimes unable to close out their positions or could only do so at great cost to themselves.

- **Cash-flow risk**

This is the risk that an organization will not be able to produce the cash to meet its derivatives obligations. In the late nineties, Korean Airlines found itself in this kind of situation and suffered heavy losses as a result. The company had been hedging against movements in the jet-fuel price by using derivatives which were denominated in dollars. When the Korean won suddenly fell in value against the dollar, the company found that the cost of the dollars needed to service its derivatives contracts had soared. The company lost out because it had not hedged against the risk of a negative movement in the currency differential between the won and the U.S. dollar.

The perils of liquidity and cash-flow risk: Metallgesellschaft AG

In 1993 the German conglomerate Metallgesellschaft AG announced that its Refining and Marketing Group (MGRM) had been responsible for huge losses of around US$1.5 billion, which it had incurred by writing oil futures contracts on the New York Mercantile Exchange (NYMEX). The great irony of the situation was that its position had been perfectly sound from an economic point of view. The company's difficulties stemmed from the fact that it had ignored the perils of liquidity and cash-flow risk.

In the early 1990s, MGRM agreed to sell 160 million barrels of oil at a fixed price at regular intervals over a 10-year period. At the time this kind of forward contract looked like a lucrative strategy: as long as the spot price for oil remained lower than the price that MGRM had fixed, the company was sure to make a profit. However, the company was vulnerable to a rising oil price, so it hedged this risk using futures contracts. Thus, if the oil price rose it would lose on its fixed-price forward contracts, but gain on its futures. If the price fell, it would gain on the forward contracts, but lose on the futures. This appeared to hedge MGRM's price risk adequately, but unfortunately failed to take account of its liquidity and cash-flow risk.

One of MGRM's problems was the sheer size of the position it had taken. The 160 million barrels of oil that it had committed to sell was equivalent to Kuwait's entire production over an 83-day period. It has been estimated that the number of futures contracts needed to hedge the position would have been around 55,000. NYMEX was known to be a large and liquid market, but its trade in contracts relevant to MGRM's position averaged somewhere between 15,000 and 30,000 per day. There was thus a clear theoretical risk that MGRM could have problems liquidating its futures position. This risk created an imbalance in the market as many other players realized the size of MGRM's position, which became in itself a factor in market pricing. Prices inevitably began to move against the company.

This liquidity risk was compounded by the cash-flow risk which resulted from the way that MGRM's hedge had been structured. As was noted earlier, when oil prices went down, the value of the company's fixed-rate forward contracts rose and the value of the futures fell. The problem arose because although the forward contracts increased in value, they did not generate the cash flow which was needed to fund the regular margin calls that were due on the futures contracts. The structure of the hedge had succeeded in dealing with price risk over the life of the hedge but had failed to deal with cash-flow risk in the short term. This was probably the major factor in the staggering losses that the company suffered.

BASIS RISK

- **What is basis risk?**

Basis risk is the risk of loss due to an adverse move or the breakdown of expected differentials between two prices (usually different products). In the context of price-risk management, it describes the risk that the value of a hedge (using a derivative contract or structure) may not move up or down in sync with the value of the price exposure that is being managed.

In the energy market, these market movements may be triggered by factors such as poor weather conditions, political developments, physical events or changes in regulation. These can lead to basis risk occurring in circumstances such as the following:

- Physical material in one location cannot be delivered to relieve a shortage in another location.
- A different quality of product cannot be substituted for an energy product in severe shortage. This often happens in the pipeline gas and power markets if there are any problems with transmission networks.
- There is not enough time to transport or produce an energy product to alleviate a shortage in the market.

When conducting price-risk management, the ideal derivatives contract is one that has a zero risk or the lowest basis risk with the energy price from which protection is needed. The larger the basis risk, the less useful the derivative is for risk-management purposes.

The attraction of over-the-counter (OTC) swaps and options is that basis risk can at times be zero, as OTC contracts can often price against the same price reference as the physical oil. However, futures contracts (sometimes referred to as "on-exchange" derivatives) traded on exchanges such as the Intercontinental Exchange, the New York Mercantile Exchange and the Tokyo Commodity Exchange all have their pricing references and terms fixed in the exchange's regulations. This means that if their pricing reference does not match the underlying physical exposure, the basis risk must either be accepted or an OTC alternative needs to be sought. (There will be more on the differences, and respective advantages and disadvantages of on-exchange and OTC contracts in later chapters.)

- **Components of basis risk**

Locational Basis

You utilize a derivatives contract which prices against exactly the same specification of energy against which you are hedging price risk. However, the derivatives contract is pricing against the same energy contract but in a different geographic region. When this occurs, you have locational basis risk. Localized supply/demand factors, political tension, grid problems or, in the case of hydrocarbons/gas, pipeline problems, in either the location used for pricing the derivatives contract or the location of your physical supply could make your derivatives contract a liability rather than a risk-reducing benefit.

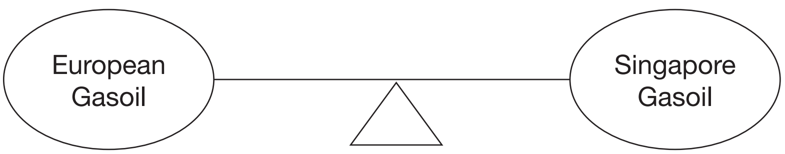

FIGURE 1.2 Locational basis

Time Basis

This is a common exposure in many markets. In Energy markets a time basis exposure can be very dangerous, particularly when there is a sudden shift in demand or transportation problems occur.

For example, a merchant power generator in the United States is expecting stronger Natural Gas prices in the summer time (due to additional use of air conditioning etc.). It hedges its position by buying the August contract in NYMEX Natural Gas Henry Hub futures. If a severe heat wave was to arrive early in summer, say in late June, then the price of July nat gas may become much stronger than the August price. That is, August nat gas futures may not give adequate price risk cover against the July nat gas requirement.

FIGURE 1.3 Time basis

Brent Crude futures and the Cushing Cushion

The success of the Brent Crude oil futures contract is an interesting example of the importance of basis risk in the energy markets. This contract was first traded on London's International Petroleum Exchange (IPE) in 1983, two years after the West Texas Intermediate (WTI) crude futures contract had been launched on the NYMEX. On the surface, both contracts do similar jobs, for hedging purposes, at least. So, over the years, why have international companies chosen to hedge with the IPE Brent futures contract rather than its better-established and more liquid American rival?

The answer is a particular kind of basis risk, known in the industry as the "Cushing Cushion" (after the Cushing refinery in Oklahoma, the destination of several of the major oil pipelines in the south-east United States). The Cushing Cushion enables the WTI's crude price in the U.S. to act totally independently of international market prices. This can be because pipeline bottlenecks at the Gulf coast are preventing additional foreign crude from reaching the mid-continent refineries or it can be because bad weather has closed the Louisiana Offshore Offloading Point (LOOP), halting the offloading of foreign crude from carriers into the pipeline system.

In situations like these, the first reaction of speculators and refineries which depend on oil in the pipeline system is to buy WTI NYMEX Futures. Sometimes WTI premiums of US$3 a barrel over the IPE Brent price have resulted from LOOP problems, pipeline problems or both.

So for anyone hedging international crudes such as West African, Brent, Mid East crude oils, Dubai or Tapis, the WTI NYMEX contract carries a significant basis risk. The IPE* Brent future, on the other hand, is exempt from this basis risk, which is almost certainly one of the keys to its success.

*The IPE is now known as The ICE, www.theice.com

- **Mixed basis risk**

Mixed basis risk occurs when an underlying position is hedged with more than one type of mismatch between the energy that is the subject of the price-risk management and the pricing index reference of the derivatives instrument that is being used. For example, if a January gasoil (heating oil) cargo is hedged with a March jet kerosene swap, it would leave both time and product basis exposures.

LEGAL, OPERATIONAL AND TAX RISKS

- **Legal risk**

This is the risk that derivatives contracts may be not be enforceable in certain circumstances. The most common concerns in this area surround clauses on netting of settlements, netting of trade, bankruptcy and the concern that the liquidation of contracts may be unenforceable. Opinions on many jurisdictions around the world can be obtained from the International Swaps Dealers Association (ISDA).

- **Operational risk**

The risk that may occur through the errors or omissions in the processing and settlement of derivatives is known as operational risk. Internal controls alongside an appropriate back-office system (whether manual or computerized) should be employed to reduce this risk.

- **Tax risk**

Tax risk can occur when there are changes to taxation regulations that affect either the derivatives market directly or the physical underlying energy market in some way. This can create additional costs to the trade. For derivatives contracts, the issue of imposed withholding taxes on any settlement payments is normally an issue covered by ISDA contracts.

SUMMARY

When designing an energy-price risk management or trading program, it is essential to be aware of all the risks that are involved in the energy market and the ways in which they interrelate. But it is important to remember that any hedging strategy which focuses narrowly on any one of the risks outlined in this chapter and ignores the others may be worse than having no hedging strategy at all.

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CHAPTER 2

The Energy Derivatives Markets

ON EXCHANGE AND OFF EXCHANGE

Derivatives normally make the headlines for all the wrong reasons. In the public mind, they are often associated with the activities of greedy speculators or with highly publicized corporate financial disasters. This is ironic because derivatives are essentially instruments to manage and reduce risk. They were created to provide opportunities to minimize price risk and to lock in profits, while reducing balance-sheet volatility and the potential for losses. It is true that there have been cases in which the use of derivatives has led to spectacular losses but this has normally been the result of their mistaken misuse or outright abuse by incompetent or ruthless individuals. Certainly, in the normal course of business life, derivatives are a prudent and, indeed, indispensable tool of price-risk management.

Derivatives are financial contracts that derive their price or value from an underlying price or asset reference. They can be divided into three main types: futures contracts, swaps contracts and options.

- **Energy futures** contracts are legally binding standardized agreements on a regulated futures exchange to make or take delivery of a specified energy product (oil, gas, power), at a fixed date in the future, and at a price agreed when the deal is executed.
- **Energy swaps** represent an obligation between two parties to exchange — or swap — cash flows, one of which is a fixed price normally agreed at execution; the other is based on the average of a floating price index during the contract period. No physical

delivery of the underlying energy takes place; there is only money settlement.

- **Options** are agreements between two parties that give the buyer of the option the right, but not the obligation, to buy or sell at a specified price on or before a specific future date. They can apply to a specific futures contract (a futures option) or a specific cash flow (if an OTC Option) or they can be used to buy or sell a specific swap contract (if an OTC swaption). When the option is exercised, the seller of the option (also known as the writer) must deliver or take delivery of the underlying asset or contract at the specified price (unlike a swap in which there is no obligation). The specified price is known as the "strike price", which is the price level at which the option becomes profitable independent of the seller or buyer.

Derivatives are often referred to as "off-balance-sheet" items. This term is used because, in the past, there was no need for derivatives to appear on a company's balance sheet (now this is only the case when hedging using derivatives). Derivatives weren't required to appear on the balance sheet because a derivatives contract requires no transfer of the principal value of the contract; in other words, there is no commitment to lend money or take money. For example, when a US$1 million swap is traded, the principal value is not exchanged. Instead, an exchange is made of the cash flow of the difference between the agreed fixed price on the derivative instrument and the forward floating-price reference that the derivative is priced out against.

ON-EXCHANGE AND OVER-THE-COUNTER

In the energy industry, derivatives can be bought and sold in two main ways: on-exchange and over-the-counter (OTC). On-exchange refers to the futures markets which are found on regulated financial exchanges such as the New York Mercantile Exchange (NYMEX) and London's International Petroleum Exchange (ICE). The OTC market is specific to the non-standard swaps and OTC options. These are usually traded directly between two companies (principals, players) in the energy markets.

Although the futures markets are important to the energy industry, they rely much more heavily on OTC derivatives. This is because OTC derivatives are customized transactions, whereas their on-exchange counterpart, the "futures" contract, is a standard contract. In theory, each deal on the OTC market is unique, so it is important to be alert to contract terms, pricing mechanisms and price reference when using OTC derivatives. Some companies find that the measurement and control of risks can be more difficult with an OTC contract because of the lack of price and liquidity transparency in the OTC market (unlike regulated futures exchanges which publish public real-time price data) and this can create the possibility of an unexpected loss. Sometimes there are additional legal, credit and operational risks with OTC derivatives compared to on-exchange futures contracts. However, the OTC market remains a popular option for price-risk management purposes. Many companies find that there are benefits in the flexibility of an OTC derivative because it can be valued against the same price reference as the energy which is being produced or consumed.

FUTURES

• A brief history of the futures markets

Oil futures contracts have been traded on financial exchanges since the 1970s, although *ad-hoc* negotiated physical-supply contracts have been around since oil was drilled in the United States in the 1850s. The first formalized regulated futures exchange for oil was NYMEX, which started contracts on heating oil in 1977 (re-launched as the current contract in 1979) and followed by West-Texas-Intermediate contract (WTI crude). On the other side of the Atlantic, the International Petroleum Exchange (ICE) of London was launched in 1981 and now boasts, in the Brent Crude Oil Futures contract, the leading international benchmark for the pricing of physical crude markets around the world; approximately 70% of the world's crude oil markets price in some way against Brent Crude Oil. Both NYMEX and ICE also operate futures markets for natural gas and electricity/power.

In the Far East, SIMEX (now merged into SGX in Singapore) ran a popular fuel-oil futures contract in Singapore until the early 1990s, when it was overtaken in popularity by the OTC derivatives market and Asia is now practically dependent on OTC derivatives for risk-management purposes in energy markets. However, the Dubai Mercantile Exchange (DME) Oman Crude Futures contract launched on 1 June 2007 has been attracting both interest and trading volume and this could become a useful on-exchange futures contract tool for Middle East crude hedging, particularly since Asia is heavily dependent on Middle East crude imports for oil-refinery operation (see Chapter 4).

FUTURES VS. OTC

At one time it was easy to distinguish the futures market from the OTC market and to establish their relative advantages. When a risk manager or trader used futures contracts they knew that the contract would be traded on an exchange, that they would have an account with their futures broker and that they were operating in a highly regulated market. They could also see the price of the contract on a screen and could be sure that the security of the contract and its performance would be guaranteed by the clearing house of the exchange. This in turn was guaranteed by "margins" (good-faith payments by everyone with a futures position on that particular exchange) together with the funding the exchange raised itself and the funds contributed by its clearing broker members.

Margins on a futures exchange can be split into two types: initial and variation. Initial margin is the good-faith deposit that is placed with the clearing house or that a broker finances (at a cost) when a trade is opened. Variation margin is the daily revaluation of a portfolio with the clearing house. If the valuation is negative, you or your broker (if you have a credit line) will have to place a margin to cover that negative variation margin. If the next day the portfolio has a positive variation margin (that is, it is showing an unrealized profit), because the position has not yet been traded or closed out, some of that margin will be returned.

However, when OTC contracts are used there is usually credit risk of the other company in the transaction to consider, as well as a liquidity risk and a lack of price transparency because there is no screen to display a real-time price. The basic workings of a futures market are illustrated in Figure 2.1.

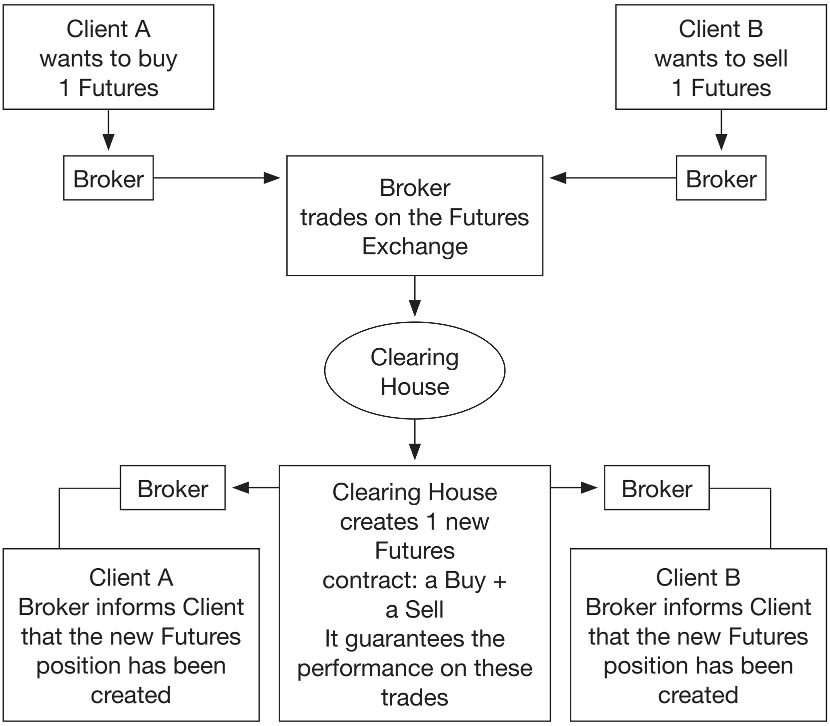


FIGURE 2.1 Basic futures trade transaction flow

• The convergence of OTC and futures

The clear distinction between the OTC energy market and the futures markets is now disappearing as the two markets converge. Clearing houses around the world have started to accept OTC trades into their guarantee umbrella. This means that after executing bilateral OTC trades with one another, both counterparties can agree to "give-in" their OTC deal to a clearing house. This process basically makes the clearing house the counterparty to the OTC deal, so that the two OTC counterparties can benefit from the higher credit quality of the clearing house as well as getting other benefits such as more netting opportunities on settlement and offsetting of positions.

The usual market approach is for two OTC counterparties to trade an OTC derivative contract with one another directly and to take on one another's credit risk, as illustrated in Figure 2.2.

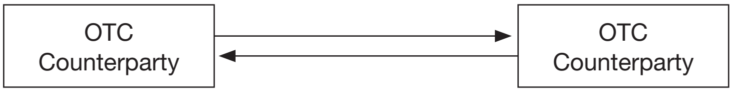


FIGURE 2.2 Direct OTC dealing

In the new convergence environment, the situation is illustrated in Figure 2.3.

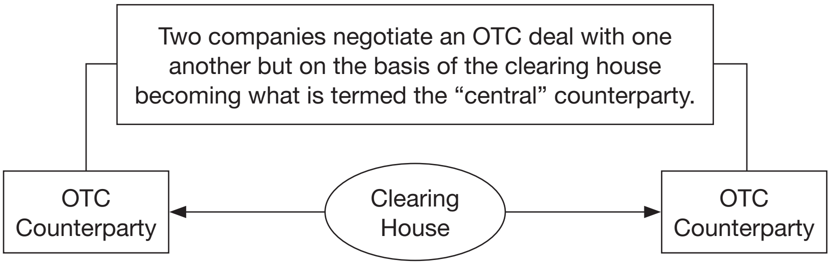


FIGURE 2.3 The role of the clearing house

Although market-share penetration has been slow in the oil sector, we have seen the newer power and gas markets embracing electronic trading platforms in a big way. This has brought about greater price transparency as users can view and trade prices on screen as in futures markets.

- **Settlement on expiry**

Energy futures contracts all entail physical and cash delivery on expiry (apart from ICE Brent crude futures in London). So if a seller holds the futures contract to expiry, he will have to deliver the underlying physical energy (oil, gas, power); and if a buyer holds the contract to expiry, he will have to take delivery of the underlying physical energy. However, actual delivery via futures markets like the NYMEX or ICE is very small, normally less than 2% of the total open interest (the total amount of outstanding contracts in the market). The majority of trades on these markets are for hedging and/or speculative purposes, with consumers or producers of energy preferring to make delivery via the normal physical markets rather than through the futures markets.

SWAPS AND OPTIONS

- **Settlement on expiry**

Swaps are contracts which, unlike futures, never go to physical delivery. They are by their very legal structure purely financially based contracts, which allow companies to benefit from the price/value movement of the underlying asset from which the swaps price is derived. It is called a swap because the two counterparties to the deal, the buyer and the seller, exchange an agreed fixed price on a particular day for the unknown floating price in the future. When traders are negotiating an OTC deal they focus on the fixed price; the floating-price reference (see Chapter 3); the pricing period (for example, one month, quarterly, calendar year); the start, or effective, date; the end, or termination, date; and the payment-due date.

For a swap priced against an American or European floating-price reference, the payment-due date is normally the fifth business day after the last pricing day of each pricing period. In energy and general commodity markets, OTC derivatives will price out monthly; so even if a quarterly contract is traded, after each month during the pricing period, one-third of the volume will price out and a settlement will become due or a payment will be received by the organization. For contracts pricing against an Asian-based floating-price reference, payment for settlement is generally due 10 business days, sometimes up to 14 business days, after each pricing period.

- **Option contracts on expiry**

What happens to an option contract on expiry and when or whether it is exercised (transfers into its underlying) depends very much on the type of option it is, on whether it is a futures option (traded on a futures exchange — a "traded option") or whether it is an OTC option.

When a traded options position is held on a futures exchange, if the option is "in the money" on expiry, the clearing house will prompt clearing brokers to notify their customers that their option is in the money and request whether they wish to exercise the option. An option is in the money when it has intrinsic value; that is, when exercising the option into its underlying futures contract (in respect of traded options) and then trading out (closing out) that futures contract would bring a profit. In some instances, if the traded option is heavily in the money, the futures exchange clearing house may even exercise it automatically, which acts as a safety net for users of the market.

However, there are no safety nets in the OTC world of derivatives. If one of the parties has a profitable swaption that it could exercise into a profitable swaps position but forgets to tell the counterparty that it wishes to exercise it by the cut-off time specified in the original option contract, it then becomes open to negotiation whether the counterparty will allow the swaption to be exercised; and if they do, it will most probably come at a price.

TYPES OF SWAPS IN ENERGY MARKETS

- **Plain vanilla**

This is the term used to describe a simple monthly averaging swap in which a fixed price is exchanged against a floating price in the future. These swaps are used extensively in oil, LPG, and LNG-related hedging and trading.

When executing the deal, the counterparties agree on the fixed price for that day, and on which floating price reference they will use to calculate the settlement.

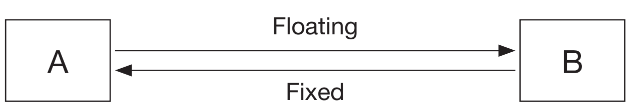


FIGURE 2.4 A plain-vanilla swap

Cash-flow example of plain-vanilla deal

Counterparty A buys fixed price $15.00 (buys fixed, sells floating)

Counterparty B sells fixed price $15.00 (sells fixed, buys floating)

Floating price reference (for example, Platts) average during the price period $16.00

Net result: Counterparty A = + $1.00 (difference between fixed/floating)

Counterparty B = – $1.00

Counterparty B pays Counterparty A $1.00 (only the difference is exchanged, NOT the principal notional amount)

- **Differential swap**

A differential swap is similar to a plain-vanilla swap except that instead of having one fixed price against a floating price, it is based on the difference between a fixed price in two products. In the oil sector, the most popular differential swap is the jet kero against gasoil, commonly termed the "regrade" swap.

FIGURE 2.5 A differential swap

Cash-flow example of differential swap

Counterparty A buys fixed-price kero and sells fixed-price gasoil at a difference of US$0.50 per barrel kero premium.

Counterparty B sells fixed-price kero and buys fixed-price gasoil at a difference of US$0.50 per barrel kero premium.

Floating price reference (Platts) kero and gasoil average difference during the price period = 0.60 kero premium.

Net Result: Counterparty A = + $0.10 (difference between fixed and floating differential)

Counterparty B = – $0.10 cents per barrel

Counterparty B pays Counterparty A $0.10 (only the difference is exchanged, NOT the principal notional amount)

Differential swaps are used across the whole energy spectrum. In the power and gas markets we see "spark spreads" where hedgers and traders use derivatives pricing against the difference (referred to as the "dif") between power and gas markets. This is based on the amount to be made by burning gas and selling power in a perfect world using a standard percentage efficiency of the conversion of energy. Normal efficiency used is 49.13% and the spark spread is quoted in megawatt hours (MWh).

Table 2.1 provides an example of a spark spread; that is, the profit margin available for burning gas in a power station and the value at which electricity can be sold.

TABLE 2.1 Spark spread

Spark Spread Example				
Power Cost	Gas Price		Power Price	Spark Spread
	in Pence per therms	in £ per MWh	£/MWh	£/MWh
September	12.15	4.15	12.7	4.26
October-December	20.56	7.01	16.35	2.08
July-September	16.5	5.63	14.55	3.09

Where coal is measured against power, there is what is known as the "dark spread", which works on the same principle as the spark spread, with two fixed prices and two floating prices documented in swaps confirmation. However, the net exposure is only on the differential between the two products/instruments. In the United Kingdom, dark spreads use an energy conversion efficiency of 5,000 MT of coal producing 55Mw of electricity at an efficiency of 38%.

- **Participation swaps**

Participation swaps are similar to regular plain vanilla fixed for floating swaps as the fixed-price buyer can be 100% protected when prices rise above the agreed fixed price or the fixed-price seller can be 100% protected when prices move down below the agreed fixed price.

However, unlike an ordinary swap, the client "participates" in the downside by only an agreed percentage. The percentage of participation affects the starting fixed price of the swap. A fixed-price buyer who only wants to participate in a percentage of any price move lower may find that the fixed price quoted for a participation swap would be higher than a normal swap. On the other hand, a seller of fixed price who wanted to participate in only a percentage of any move higher that would incur a loss on the short swap position might find that the fixed price quoted would be lower than a normal swap.

- **Double-up swaps**

By using the double-up swap, swap users can achieve a swap price which is better than the actual market price, but the swap provider will retain the option to double the swap volume before the pricing period starts. If a company has price exposure to energy prices going higher, but the current plain-vanilla swap is not being quoted around its budgeted level, it may find that a double-up swap will let it hedge some of its required volume closer to its hedging budget level. The risk is that the market price could move against the derivatives position and the swap could price out against twice the original executed volume. Double-up swaps are not commonly used in the market for price-risk management purposes (hedgers tend to use options more if the current swap price is not interesting for them). However, they could offer an interesting opportunity for speculators who have a strong view on the price direction of their particular energy focus and want to get a head start by buying at a better price level than the current plain-vanilla swap, or selling at a higher level than the plain-vanilla swap quotes.

- **Margin swaps**

Margin swaps come into play where an organization can take its overall price risks from several energy inputs and outputs of the business process and get a complete swap structure that guarantees its profit margin. Organizations could construct complex hedges themselves to protect their energy inputs/outputs but this has a cost in that it involves managing many individual positions with perhaps several counterparties. It can therefore be more cost-efficient and easier to enter into a margin swap with one counterparty that is willing to provide a contract that covers all the price risks. An example of a margin swap is given in Figure 2.6, which shows the key input (crude oil feedstock) that needs to be risk managed and the five main energy outputs as petroleum products. A refiner can obtain a single swap contract that protects the NET overall margin from processing a particular type of crude and the regional values of the petroleum products produced.

But it should be remembered that price-risk management is never free and there are always costs attached to any control function in a company, internally or externally. The administrative and human resources available in the organization have to be reviewed and adjusted to correspond with the level of its derivatives activities.

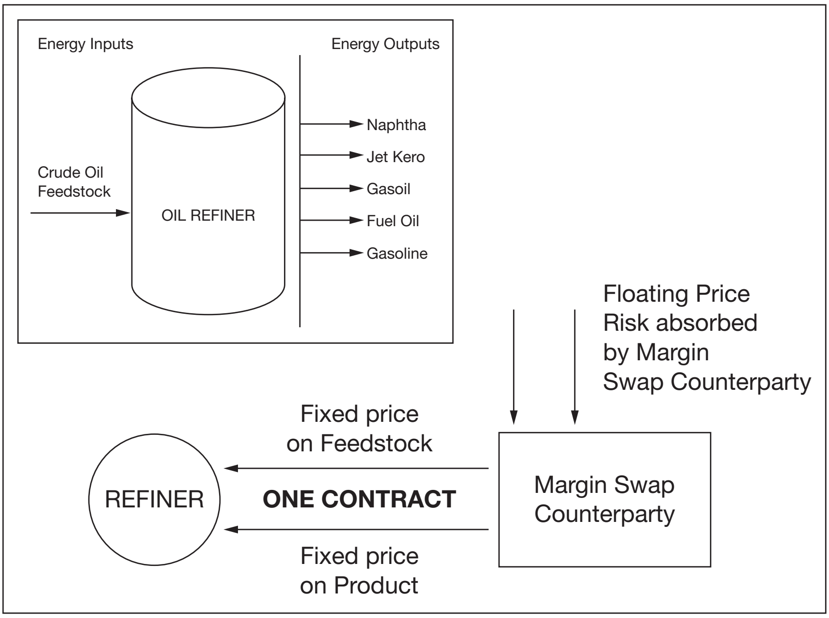


FIGURE 2.6 Example of a margin swap for an oil refiner

KNOCK-INS AND KNOCK-OUTS — INTEGRATING SWAPS AND OPTIONS

Knock-in and knock-out options are two types of barrier option which are activated if the underlying moves through a trigger price level, in the case of a knock-in, and is cancelled or de-activated, in the case of a knock-out. A market maker or trader will normally offer a more attractive price on this kind of option because the buyer is giving the seller of the option the opportunity to cancel it before its original expiry/termination date. This adds another dimension of opportunity or potentially reduced risk to the seller of the option; hence the lower price than an option of the same strike price, tenure and underlying price reference without such a barrier-option structure. Knock-in and knock-out triggers can be integrated with both swaps and options.

Figure 2.7 shows how the barrier option either comes to life (is knocked in) or is extinguished (knocked out) under certain conditions. In practice, the event which activates or kills the options is defined in terms of a price level (the barrier).

Barrier Options — Caps/Floors

		Option Out	Option In
PRICE	Up	Up-and-Out	Up-and-In
	Down	Down-and-Out	Down-and-In

FIGURE 2.7 Barrier options

A common example is the up-and-out floor (put) which is typically purchased by an energy producer to hedge its natural long position in the energy markets. This may be an attractive alternative to the normal floor or put option, as it is less expensive and provides the same price protection if prices move down from current levels. However, if prices move upwards, the increase in the underlying commodity's price reduces the need for downside risk protection at the original strike price. If the price moves up sufficiently to cross the selected "barrier" price, then the option is cancelled or extinguished.

The owner may consider re-entering a hedge by buying another floor at a higher strike price which gives more valuable protection than the floor with the lower strike price which was cancelled. The barrier option may also be combined with a rebate. For a knock-out option, the rebate is paid when the option is cancelled prior to its normal expiry as compensation to the holder.

The up-and-out barrier is less expensive than a standard Asian, European or American option because the underlying price may fall below the strike price after initially rising, hitting the barrier and cancelling the option. However, there may be liquidity issues with this strategy, as there are a limited number of traders in the market who may be able to quote on this more complicated strategy.

THE COMMON AND MORE LIQUID OPTION MARKETS IN ENERGY

- **Calls and puts, caps and floors**

On futures exchanges, traded options are referred to as "calls" and "puts", while in the OTC market the same sort of contracts are referred to as "caps" and "collars" (see Figure 2.8). A call or cap gives the buyer of the option price protection against the market moving above the agreed price, "the strike price", in return for the payment of a premium or fee. The strike price is the level at which the players can participate in the market via the option contract.

A put or floor gives the buyer of the option protection against the market moving below the strike price, again in return for the payment of a premium or fee.

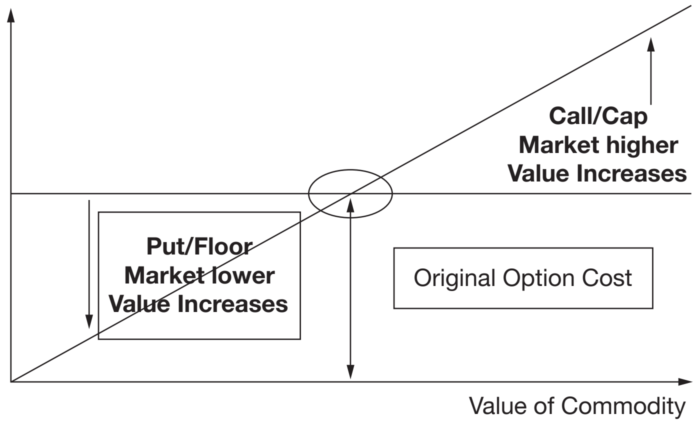


FIGURE 2.8 Calls and puts, caps and floors

Options strategies can be very flexible and can help companies achieve exactly the risk-reduction or risk-exposure profile they want. When a buyer purchases an option, the cost of the contract is the premium paid, and the buyer will not be required to pay any more than the market price demands.

If an option is sold on its own, it is called a "naked option". Here, the seller does not own the underlying physical commodity or does not have another futures or swaps position against the option that has been sold. In this case, there is unlimited risk if the market price moves in an adverse way (see Table 2.2.).

TABLE 2.2 Naked options

	If the option is sold as a naked option
Cap/Call	Potentially unlimited loss exposure on the option if the underlying market price moves above the Strike Price of the option
Floor/Put	Potentially unlimited loss exposure on the option if the underlying market price moves below the Strike Price of the option

- **Main option styles**

American: An American-style option is one that may be exercised into its underlying instrument (that is, a futures contract) on any business day until expiry. All the ICE and NYMEX traded options on energy-futures contracts are American-style. These options are more expensive than European options because they give so much flexibility to the buyer as to when the option can be exercised.

European: These are not very common in the energy markets, as they only permit the buyer to exercise the option on expiry. European options are cheaper than American options but generally more expensive than Asian-style.

OTC Asian: These are the most common option style in the OTC market and are sometimes referred to as "restrospective" or "path-dependent" options. The reason for this is that they are average price options, with their profit being dependent on the price history of the underlying energy market that is being used as the price reference, either overall or sometimes at a specific stage in the life of the option.

- **The cost of options — premium**

There are many types of option models available and each one has its own particular use, depending on the specific need. While it is not necessary to have an in-depth understanding of the mathematics of these models, users should understand what needs to be put into the model to obtain the right answers and be able to interpret the results. The principles of premium calculation are illustrated in Figure 2.9. Any options pricing model will have some fundamental inputs, as shown below, and these are key factors in determining the value of any option available in the market place. It is fair to say, though, that the following are generally the core factors that play an important role in determining the value of the option.

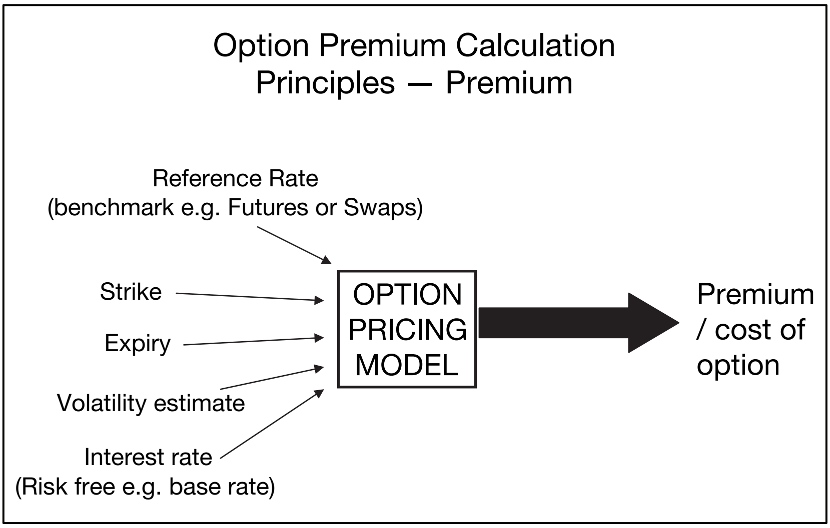


FIGURE 2.9 The principles of premium calculation

As we saw earlier, margin options can price against a complex structure of differentials rather than against a single floating-price reference. In our example of a margin swap for an oil refiner, the refiner could have bought an option on its refining margin instead of using the swap strategy. The option strategy might at first appear less attractive as it contains an up-front premium cost, whereas the swap strategy would not. However, the flexibility offered by the option strategy becomes apparent if the margin gets better. If the refiner had used the swap strategy its profitability would be fixed; although if the margin improved, any loss on the swap would be offset by better prices on the resale of its physical assets, the petroleum products. In this case, it would just have the opportunity cost. But if it paid a premium for, say, a margin option, if the margin improved more than the cost of its option strategy, it would still be able to benefit from that margin improvement. This is most useful when dealing with a current or forward negative margin — a situation with which participants in some of the fuel-oil markets will be familiar. In this case, the refiners might have good margins which they wish to lock in by using swaps on the middle distillates (naphtha, gasoil, jet, for example) but they are still faced with the need to halt any further exposure to the fuel-oil margin becoming more negative (and at the same time, they don't want to lock in a negative margin). In this instance, the refiner could look at a "crack option" (an option contract which insures the refinery against the risk of the profit margin between refining crude oil and producing fuel oil from becoming negative or even more negative, as the case may be, but still allows the refiner to benefit from a recovery in the value of this business) and still have the potential to benefit and profit from any improvement in the margin on this product in the future.

- **Option premium cash flow**

When a traded option is purchased on a futures exchange, it is normal to put up "margin" in the form of a good-faith deposit (approximately 10% of the notional value, subject to market volatility at the time of the trade). After that, the position will be marked to market (MTM) on a daily basis and there will be an obligation to finance any negative variation margin. In the case of an OTC option, the buyer normally pays the premium up front to the seller. This generation of cash premium is where OTC options can offer interesting opportunities for linkage to commodity- or energy-linked projects that require financing. It is possible to create structures that offer a price-risk hedge at the same time as generating prompt cash flow which can be reinvested in the project or in other business activities of the organization. (These activities are usually associated with the Structured Finance departments of banks.)

For traders who are trying to make money by speculating in the very risk of the energy price moving or not (as the case may be), options offer the ability to create trading strategies that profit from moves in price direction, from the price moving in a particular price band, and from the price staying the same by using volatility trades (through which money can be made not from the market price moving up or down, but on volatility increasing or decreasing).

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 3

Energy Futures Contracts

INTRODUCTION

Futures markets have been used by traders in commodities for hundreds of years. Trading in rice futures was being conducted in Osaka, Japan, as early as the eighteenth century. The New York Mercantile Exchange (NYMEX), the world's largest regulated energy-futures exchange, started life in 1872 as the Butter and Cheese Exchange of New York before being renamed 10 years later.

Exchange-traded futures and options provide several important economic benefits, including the ability to shift or otherwise manage the price risk of cash and physical market positions. As open markets, where large numbers of potential buyers and sellers compete for the best prices, futures markets — such as the TOCOM in Tokyo, the SGX in Singapore, the ICE in London, the EEX in Germany, Nord Pool in Scandinavia, NYMEX in New York, and Intercontinental Exchange out of the United States — allow energy companies to discover and establish competitive prices. Partly because these markets provide the opportunity for leveraged investments, they attract large pools of risk capital. As a result, futures markets are among the most liquid of all global financial markets, providing low transaction costs and ease of entry and exit. This, in turn, fosters their use by a wide range of businesses and investors who want to manage price risks.

Today's futures industry functions with a number of time-tested institutional arrangements, including clearing-house guarantees and exchange self-regulation.

Main Global Oil, Gas, Coal & Power Futures Exchanges

- ICE London — http://www.theice.com
- EEX — http://www.eex.de
- APX — http://www.apxgroup.com
- NYMEX New York — http://www.nymex.com
- TOCOM Tokyo/SGX — http://www.tocom.or.jp
- SGX Singapore — http://www.sgx.com
- Nord Pool — http://www.nordpool.com
- Dubai Mercantile Exchange — http://www.dubaimerc.com

KEY FACTS ABOUT FUTURES CONTRACTS

A futures contract is a standardized agreement between two parties that:

- commits one party to sell and the other party to buy a stipulated quantity and grade of oil, gas, power, coal or other specified item at a set price on or before a given date in the future;
- requires the daily settlement of all gains and losses as long as the contract remains open; and
- provides, on expiry of the contract, either for delivery of the underlying physical energy product or a final cash payment (cash settlement).

Futures contracts have several key features:

- The buyer of a futures contract, the "long", agrees to receive delivery.
- The seller of a futures contract, the "short", agrees to make delivery.
- The contracts are traded on regulated exchanges either by open outcry in specified trading areas (called pits or rings) or electronically via a computerized network.
- Futures contracts are marked to market each day at their end-of-day settlement prices, and the resulting daily gains and losses are passed through to the futures accounts held by brokers for their customers.

- Futures contracts can be terminated by an offsetting transaction (that is, an equal and opposite transaction to the one that opened the position) executed at any time prior to the expiry of the contract. The vast majority of futures contracts are terminated by offset or a final cash payment, rather than by delivery. For example, on the International Petroleum Exchange and the New York Mercantile Exchange less than 2% of the open interest (total contracts open) in their energy-futures contracts go to physical delivery each month.

A standardized energy-futures contract always has the following specific items:

- **Underlying instrument** — the energy commodity or price index upon which the contract is based
- **Size** — the amount of the underlying item covered by each contract
- **Delivery cycle** — the specified months for which contracts can be traded
- **Expiry date** — the date on which a particular futures trading contract will cease and on which all obligations under it will terminate
- **Grade or quality specification and delivery location** — a detailed description of the energy commodity or other item that is being traded and, as permitted by the contract, a specification of items of higher or lower quality or of alternative delivery locations available at a premium or discount (for example, a NYMEX WTI Crude futures contract allows traders to deliver alternative crude oils and has a table of premium and discounts that are fixed for these)
- **Settlement mechanism** — the terms of the physical delivery of the underlying item or of a terminal cash payment. In fact, the only non-standard item of a futures contract is the price of an underlying unit, which is determined in the trading arena.

The mechanics of futures trading are straightforward: both buyers and sellers deposit funds — the "initial margin" — with a brokerage firm which would be a clearing member of the exchange on which the futures contract is to be traded. This initial margin amount is typically around 10% of the total notional contract value.

If you buy a futures contract ("go long") and the price goes up, you profit by the amount of the price increase multiplied by the contract size. On the other hand, if you buy and the price goes down, you lose an amount equal to the price decrease multiplied by the contract size. If you sell a futures contract ("go short") and the price goes down, you profit by the amount of the price decrease multiplied by the contract size. If you sell and the price goes up, you lose an amount equal to the price increase multiplied by the contract size. These profits and losses are paid daily via the variation futures margin which a clearing broker must deposit with the clearing house every day on behalf of its customers. The broker either finances this for the customer or calls the customer for collateral against unrealized losses.

Some futures exchanges have position limits dependent on whether you are a speculator trader or a hedger. Also, daily maximum price movements are sometimes enforced. These usually only apply to U.S.-based exchange contracts. For example, price and position limits do not apply to ICE oil futures contracts. During the Gulf War some participants found that the NYMEX was forced to suspend trading whilst the ICE was able to continue trading. These are points to consider when choosing futures contracts.

FUTURES OPTIONS CONTRACTS

An option is the right, but not the obligation, to buy or sell a specified number of underlying futures contracts or a specified amount of an energy commodity or index at an agreed price (based on the strike price of the option) on or before a given future date.

Options on futures are traded on the same exchanges that trade the underlying futures contracts and are standardized with respect to the quantity of the underlying futures contracts, expiry date and strike price (the price at which the underlying futures contract can be bought or sold). There are two types of options — call options and put options.

A call option on a futures contract gives the buyer the right, but not the obligation, to purchase the underlying contract at a specified price (the strike or exercise price) during the life of the option. A futures put option gives the buyer the right, but not the obligation, to sell the underlying contract at the strike or exercise price before the option expires. The cost of obtaining this right to buy or sell is known as the option's "premium". This is the price that is bid and offered in the exchange pit or via the exchange's computerized trading system. As with futures, exchange-traded options positions can be closed out by offset — execution of a trade of equal size on the other side of the market from the transaction that originated the position.

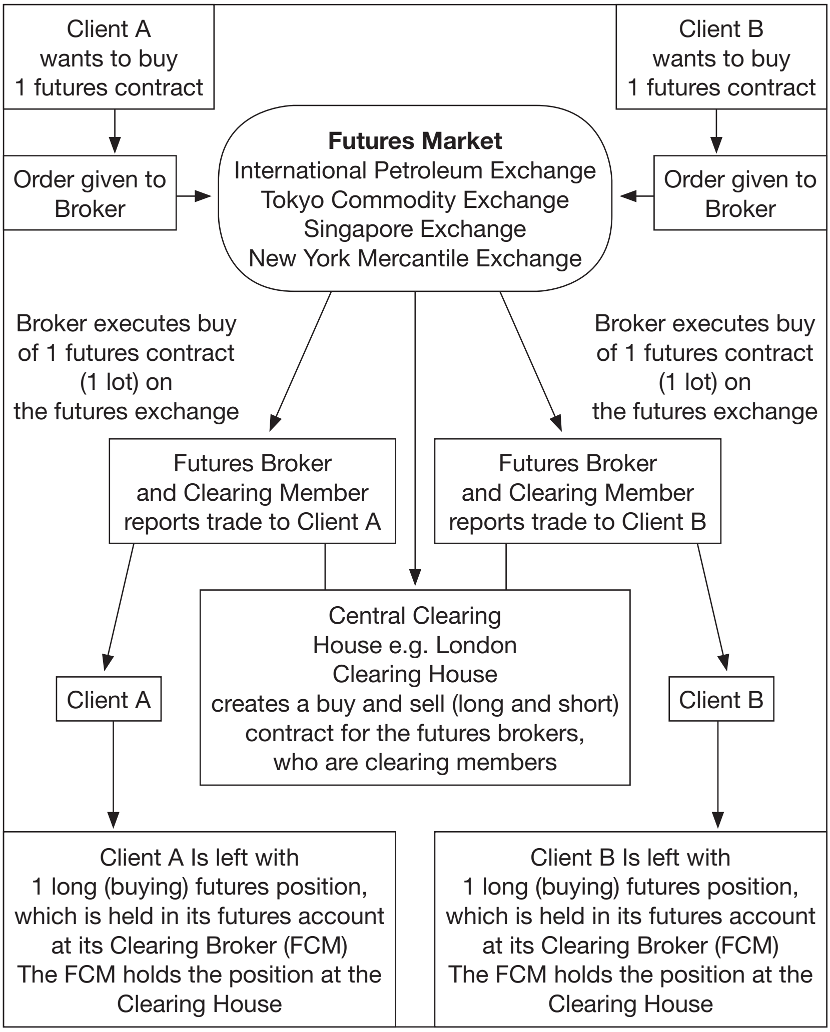
The major difference between futures and options arises from the different obligations on an option's buyer and seller. A futures contract obliges both buyer and seller to perform the contract, either by an offsetting transaction or by delivery, and both parties to a futures contract derive a profit or loss equal to the difference between the price when the contract was initiated and when it was terminated.

In contrast, an option buyer is not obliged to fulfill the option contract. The option buyer's loss is limited to the premium paid; but in order for the buyer to make a profit, the price must increase above (call option) or decrease below (put option) the option's strike price by the amount of the premium paid. In turn, the option seller (writer or grantor), in exchange for the premium received, must fulfill the option contract if the buyer so chooses. This situation — the option's exercise — takes place if the option has value (is "in the money") before it expires. The price risk for the seller of an option can be unlimited (unless the risk is hedged with other options or futures positions) and this is why some companies prohibit their traders from selling options. These companies may consider that they do not have adequate controls or systems in place to monitor short-sale option price-risk exposure.

HEDGING IN FUTURES MARKETS

The purpose of a hedge is to avoid the risk of adverse market moves resulting in major losses. Because the physical cash markets and futures markets do not always have a perfect price-correlation relationship, there is no such thing as a perfect hedge; thus there is almost always some profit or loss.

In futures markets, hedging involves taking a futures position opposite to that of a cash-market position. For example, a corn-farming co-operative would sell corn futures against its crop; an importer of Japanese cars would buy yen futures against its yen liability; a precious-metals merchant would purchase gold futures against a fixed-price gold sales contract; and an energy producer or consumer might looking at buying or selling energy futures against their price risk exposure in anticipation of a market price increase/decrease.



Source: Global Risk Partners — www.globalriskpartners.com

FIGURE 3.1 The futures trading process illustrated

Examples of the types of risk-management activities that rely on the use of futures include:

- Stabilizing cash flows
- Setting purchase or sale prices of commodities and securities
- More closely matching balance-sheet assets and liabilities

- Reducing transaction costs
- Decreasing storage costs
- Locking in "cost of carry" forward profits; that is, profitable situations that arise where the market price structure is such that if you hold energy in storage from one month to another and you sell forward in the futures markets, you can lock in a profit by holding that inventory
- Minimizing the capital needed to carry inventories and the size of security-of-supply inventories required, by locking in guaranteed physical delivery in the future. The clearing house guarantees performance of the contract.

OIL FUTURES

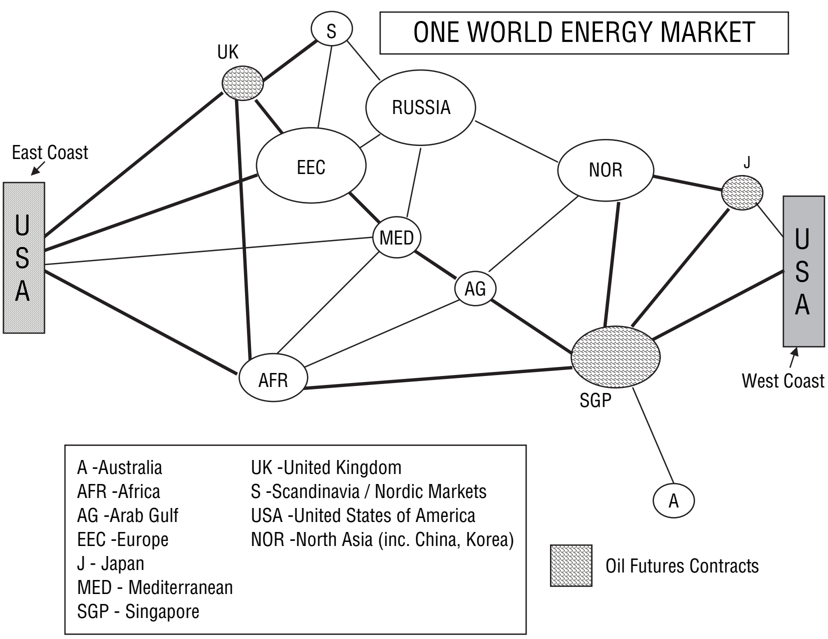


FIGURE 3.2 The key regional oil markets. Dark lines indicate key price influences.

A list of the key international energy futures markets:

- **TOCOM Tokyo/SGX — http://www.tocom.or.jp**
- **Dubai Mercantile Exchange — http://www.dubaimerc.com/**
- **ICE London — http://www.theice.com**
- **SGX Singapore — http://www.sgx.com**
- **NYMEX — http://www.nymex.com**
- **SFE — http://www.asx.com.au (Launching Power Futures)**

Gas futures — the main natural-gas futures markets

- **NYMEX — http://www.nymex.com**
- **ICE London — http://www.theice.com**

(With the prospect of a Pan-Asean natural gas pICEline interconnector grid, there should be some interesting opportunities over the next decade or so to see natural-gas trading and perhaps a natural-gas futures market develop in Thailand, Malaysia, Singapore, Indonesia etc.)

Power futures

- **Nord pool — http://www.nordpool.com**
  Nord pool Futures & Options in power for Norway, Sweden, Denmark, Finland
- **EEX European Energy Exchange — http://www.eex.de**
  EEX Futures for German Power market
- **The ICE exchange — http://www.theice.com**
  U.K. Power Futures contracts traded on ICE exchange
- **NYMEX — http://www.nymex.com**
- **APX — http://www.apxgroup.com**

EXCHANGE OF FUTURES FOR PHYSICALS (EFP) AND DELIVERIES VIA FUTURES MARKETS

Two energy-futures markets — the NYMEX market in New York and the ICE in London — offer EFPs in the context of the following examples.

Generally, no more than 2–5% of all energy futures contracts ever go to physical delivery via the exchange. (ICE Brent is the only large energy-futures contract that does not go to physical delivery on expiry, going to cash settlement instead.)

Companies which do choose to deliver, however, have several options. They can choose standard delivery (as per the specification of the futures contracts laid down in the rule book of the futures exchange) or they can attempt to arrange an alternative delivery procedure (ADP). This would normally happen if someone wishes to deliver some energy which is not in keeping with the specifications of the futures contract (so it cannot be delivered via the exchange/clearing-house procedure) or two parties are stuck with a position and wish to negotiate directly with one another on some cash settlement. In ADP transactions, market participants release both the exchange and their clearing broker from all liabilities related to the delivery negotiated between parties. Traders and hedgers can also execute an EFP.

- **EFPs**

Companies using energy-futures contracts for hedging purposes are often not interested in making or taking delivery at the specified locations. In many cases, they are not interested in being matched to a trading partner by the futures exchange. More often than not, a hedger using futures finds it more economical to make or take delivery of physical energy elsewhere, under terms that differ from those of the futures contract. An EFP provides the mechanism for such transactions and is usually the preferred method of delivery because it provides greater flexibility. EFPs allow companies to choose their trading partners, delivery site, the grade of product to be delivered, and the timing of delivery. The EFP mechanism allows buyers and sellers to execute their physical energy-market transaction on the basis of negotiated price. However, the quantity of the cash commodity involved in an EFP must be approximately equal to the quantity specified by the number of futures contracts involved in the EFP. This is the main concern of futures exchanges, which will investigate from time to time to ensure that parties to EFPs are executing the equivalent volume of physical to futures.

After both parties to an EFP agree to such a transaction, the price at which the EFP is to be cleared is submitted to their futures broker who, in turn, submits it to the futures exchange, which then registers the trade. The price of the futures position created by the EFP can be outside the daily trading range of that futures market. This is the nominal price of the EFP. The EFP parties can then effect the actual physical exchange at a price they negotiate between themselves.

- **The practical mechanics of an EFP transaction**

EFPs can be effected between two futures market participants — a long and a short hedger — provided there is a physical market transaction between the parties.

For example, a futures market long (a buyer) would take delivery of crude oil from a futures market short (the seller) with whom the EFP is conducted. In this transaction, the buyer's hedge is liquidated, as is the seller's, and the actual transfer of crude oil occurs between the parties, not via the exchange.

An EFP market is normally quoted amongst futures brokers, so this is the first point of call for any organization looking to find some counterparty to an EFP transaction.

Example: Using EFP to initiate a position

On 15 December, an oil refiner who wishes to protect a portion of his oil-products inventory wishes to sell futures to protect against falling prices. At the same time, a gasoil distributor is concerned about rising prices and looks to buy to protect his forward purchases. They agree to a price of gasoil, net the basis, and register the EFP with the futures exchange (ICE or NYMEX).

Once registered, both parties will receive a futures position at a price which reflects the exact basis between the futures contract chosen and the specific physical gasoil price.

On 14 January, the diesel refiner arranges with the distributor for the physical delivery of the fuel. At that time, the refiner and the distributor independently offset their futures positions on the exchange via their broker.

In this case, the long (buyer) sells back its futures position into the exchange and the short (seller) hedgers buy back their short hedge from the exchange. They have "swapped" futures obligations, thus terminating their contract obligations on the exchange and open interest in the relevant futures contract would therefore reduce. In other words, they have closed out their futures contracts before expiry — before they matured — in consideration of their exchange of physical market positions. The transaction occurs at the price, location and time negotiated by the parties.

Example: Using EFP to liquidate (close out) a position

On 15 December, a crude-oil trading company wants to cover forward purchases of West African crude oil, so it buys 500 contracts of February ICE Brent Futures (500,000 barrels) on the exchange at a price of US$24 per barrel.

At about the same time, a crude-oil producer in Africa is seeking to protect the value of its forward floating-price crude-oil physical-sale contracts. So it sells 500 contracts of the February ICE Brent Futures (500,000 barrels) at a price of US$24.15 (on a different day).

On 12 January, the two companies agree to a cash deal for 500,000 barrels of Bonny Light crude oil, the equivalent of 500 ICE Brent Futures contracts.

Since both companies have hedge positions already in their futures broker accounts, they agree to close out those hedge positions by use of an EFP.

Since they can register the EFP with the exchange at any agreed price, they agree to use a price that is equal to the exact basis of their delivery point and the price quoted on the exchange.

By using the EFP, the hedge is taken off using the exact basis. This avoids the possible market risk of covering the hedge in the open market at the exchange where there is no guarantee as to the price at which the hedge would be liquidated. It also enables the removal of timing risk as the hedge can be closed out/netted out simultaneously with the physical transaction being executed. Quite often, traders in crude-oil markets are trading VLCC (Very Large Crude Carriers) which carry two million barrels, or 2,000 lots, of either NYMEX WTI Futures or ICE Brent Futures. Trying to close this position out without adversely affecting the market price arising from futures-market liquidity issues would take many hours to conclude, if it were not for the EFP mechanism. On average, the ICE Brent or NYMEX WTI futures usually trade in clip sizes of 100 lots, or 100,000 barrels.

EFPs can involve deliveries to points other than those specified in the underlying futures contracts, and/or different energy commodities, and/or different delivery periods, while transaction prices can be negotiated between parties to the EFPs. These negotiated prices can reflect differentials based on quality, location and timing, including transportation and quality differentials between the two products and delivery points.

The exchange clearing house treats EFPs as trades for margin purposes. Once the EFP is effected, margin funds can be released on the business day following the posting of the EFP.

In EFPs involving a futures-market hedger and a physical product-market participant that initially is not holding a futures position, the hedger's margin funds are released on the business day following the EFP posting. The physical-market participant then becomes responsible for maintaining the account established for margin funds until the hedge is liquidated or delivery of the contracts is made.

The NYMEX requires written documentation on EFPs and provides standardized forms for this purpose. However, the ICE market in London does not require written documentation, but it still reserves the right to make enquiries at any time.

Information to be supplied can include:

- the fact that an EFP transaction is being effected
- a statement that the EFP has resulted in a change in ownership of a particular energy commodity
- the date the transaction occurred
- the type and quantity of the energy futures involved in the EFP transaction
- the price at which the futures transaction is to be cleared
- the names of the clearing broker members involved in the EFP.

The buyer's and seller's clearing members must satisfy the exchange that the transaction is a legitimate EFP. Evidence of a change in ownership of the cash commodity involved in the EFP (or a commitment for such a change), as well as payment received by the firm selling the product, must be made available to the exchange and secured by the clearing brokers representing the parties to the EFP upon specific request from the exchange.

Below is a summary of the key oil futures contracts traded around the world. Check with your broker and/or the relevant exchange for any changes in these terms and conditions from time to time before using the contract for investment or hedging purposes.

ICE (London) Brent Crude Futures Contract — Specification

Date of launch

23 June 1988 — money settlement, no physical delivery

Trading hours

Open: 08:00 Close: 09:45 (local time, electronic)
Open: 10:02 Close: 19:30 (local time, open outcry)

Unit of trading

One or more lots of 1,000 net barrels (42,000 U.S. gallons) of Brent crude oil

Specification

Current pICEline export quality Brent blend as supplied at Sullom Voe

Quotation

The contract price is in U.S. dollars and cents per barrel.

Minimum price fluctuation

One cent per barrel, equivalent to a tick value of $10

Maximum daily price fluctuation

Unlimited

Daily margin

All open contracts are marked-to-market daily.

Trading period

12 consecutive months, then quarterly out to a maximum 24 months and then half-yearly out to a maximum 36 months

Position limits

Unlimited

ICE (London) Brent Crude Options Contract — Specification

Date of launch

11 May 1989

Trading hours

Open: 10:02 Close: 19:30 (local time)

Unit of trading

One ICE Brent Crude futures contract

Quotation

The contract price is in U.S. dollars and cents per barrel.

Strike-price increments

Multiples of 50 cents per barrel

A minimum of five strike prices are listed for each contract month: one nearest to the previous business day's official settlement price for that month; two (or more) above and two (or more) below that price.

During any trading day the exchange may add one or more strike prices nearest to the last price listed.

Minimum price fluctuation

One U.S. cent per barrel

Maximum daily price fluctuation

Unlimited

Daily margin

All open contracts are marked-to-market daily.

Option premium

Due to futures-style margining, option premiums are not paid/received at the time of the transaction. Rather, margins are paid/received every day according to the changing value of the option and the total value to be paid/received is only known when the position is closed (by an opposing sale/purchase, exercise or expiry). It is a fundamental principle of option trading that the buyer never pays more than the premium.

Trading period

The first six quoted months of the underlying ICE Brent Crude futures contract, with a new position being introduced immediately on expiry of the first option month, such that six months will always be quoted

Position limits

Unlimited

Cessation of trading

Trading ceases at the close of business on the third business day prior to cessation of trading in the underlying ICE Brent Crude futures contract.

Exercise and automatic exercise

ICE Brent Crude options can be exercised into Brent Crude futures contracts. ICE options contracts are of American-style exercise, allowing the buyer to exercise call and/or put options up to 17:00 hours on any business day (except on expiry day) during the life of the contracts, by giving an exercise notice to the **London Clearing House** in respect of such options.

On expiry day the buyer has up to one hour after the cessation of trading to exercise his options. At that time LCH will automatically exercise all options that are in the money on behalf of the member unless instructed otherwise by the member.

ICE (London) Gasoil Future Contract — Specification

Date of launch

6 April 1981 — physical-delivery-on-expiry settlement

Trading hours

Open: 08:00 Close: 09:00 (local time, electronic)
Open: 09:15 Close: 17:27 (local time, open outcry)

Scope

Contracts are for the future delivery of gasoil into barge or coaster or by in-tank or inter-tank transfer from Customs and Excise bonded-storage installations or refineries in the Amsterdam, Rotterdam, Antwerp (ARA) area (including Vlissingen and Ghent) between the 16th and the last calendar day of the delivery month.

Unit of trading

One or more lots of 100 metric tons of gasoil, with delivery by volume; namely, 118.35 cubic meters per lot being the equivalent of 100 tons of gasoil at a density of 0.845 kg/liter in vacuum at 15°C

Specification

Gasoil is to be delivered in bulk and free of all liens and claims, and be of merchantable quality conforming to the quality specification

Origin

Any origin that is EU qualified.

Quotation

The contract price is in U.S. dollars and cents per ton (on an EU import duty-paid basis).

Minimum price fluctuation

25 cents per ton, equivalent to a tick value of $25

Maximum daily price fluctuation

Unlimited

Daily margin

All open contracts are marked-to-market daily.

Trading period

Up to 12 consecutive months forward, then quarterly out to 24 months, then half-yearly out to 36 months.

Position limits

Unlimited

ICE (London) Gasoil Options Contract — Specification

Date of launch

20 July 1987

Trading hours

Open: 09:15 Close: 17:27 (local time)

Unit of trading

One ICE gasoil futures contract

Quotation

The contract price is in U.S. dollars and cents per ton.

Strike-price increments

Multiples of US$2.50 per ton

A minimum of five strike prices are listed for each contract month; one nearest to the previous business day's official settlement price for that month, two (or more) above and two (or more) below that price. During any trading day the exchange may add one or more strike prices nearest to the last price listed.

Minimum price fluctuation

Five U.S. cents per ton

Maximum daily price fluctuation

Unlimited

Daily margin

All open contracts are marked-to-market daily.

Option premium

Due to futures-style margining, option premiums are not paid/received at the time of the transaction. Rather, margins are paid/received every day according to the changing value of the option and the total value to be paid/received is only known when the position is closed (by an opposing sale/purchase, exercise or expiry). It is a fundamental principle of option trading that the buyer never pays more than the premium.

Trading period

The first 11 quoted months of the underlying gasoil futures contract, with a new position being introduced immediately on expiry of the first option month, such that 11 months will always be quoted.

Position limits

Unlimited

Cessation of trading

Trading ceases at close of business on the fifth business day prior to cessation of trading in the underlying ICE gasoil futures contract.

Exercise and automatic exercise

ICE gasoil options can be exercised into gasoil futures contracts. ICE options contracts are for American-style exercise, allowing the buyer to exercise call and/or put options up to 17:00 hours on any business day (except on expiry day) during the life of the contracts, by giving an exercise notice to LCH in respect of such options.

On expiry day the buyer has up to one hour after the cessation of trading to exercise his options. At that time LCH will automatically exercise all options that are in the money on behalf of the member unless instructed otherwise by the member.

ICE Natural Gas Futures Contract — Specification

Date of launch

31 January 1997

Trading hours

Open: 09:30 Close: 17:00 (U.K. time)
Daily contracts: Open: 09:30 Close: 16:00 (U.K. time)

Trading mechanism

Electronic, Energy Trading System (ETSII)
Also by Exchange of Futures for Physicals (EFPs)

Unit of trading

One lot equals 1,000 therms of natural gas per day of contract duration
(1 therm = 29.3071 kilowatt hours)

Contract size

Minimum of five lots of 1,000 therms per lot
(for example: five lots September = 5 × 1,000 therms × 30 days = 150,000 therms)

Quotation

Sterling pence per therm. Minimum price movement ("tick size") 0.01 pence per therm

Maximum daily price fluctuation

Unlimited

Contract description

Season contracts are strips of six individual and consecutive contract months (always either an April–September strip or an October–March strip). Quarter contracts are strips of three individual and consecutive contract months (always January–February–March; April–May–June; July–August–September; or October–November–December).

Month contracts are strips made up of individual and consecutive calendar days. A monthly contract is 28, 29, 30 or 31 individual day contracts, determined by the precise number of calendar days in the month. Month contracts are listed nine, 10 or 11 consecutive months into the future.

A Balance of the Month (BOM) contract is a strip of individual day contracts. The precise number of day contracts is determined by the number of days outstanding in the current calendar month. The BOM contract reduces in size on a daily basis, generating a daily delivery obligation.

Day contracts are listed from one day ahead (D-1) to seven days ahead (D-7).

A contract held through to expiry obligates the seller to make physical delivery. Delivery must be made equally throughout the delivery period and equivalent to the number of lots open at the time of expiry.

Initial margin

Initial margin is calculated on all open contracts and called by LCH from clearing members in order to cover the costs that may be incurred by LCH in closing the position of a member that goes into default. Initial margin is returned upon closure or at expiry of a position.

Variation margin

All open contracts are marked-to-market at the end of each trading day. Variation margin is calculated on the number of lots open for each contract. This process uses the day-to-day change in settlement price for each contract.

Dubai Mercantile Exchange — Oman Crude Oil Futures Contract

Trading unit

1,000 U.S. barrels (42,000 gallons)

Price quotation

U.S. dollars and cents per barrel

Trading symbol

OQ

Trading hours

Open: 18:00 Close 17:15 (NY time) — Sunday through Friday

Trading mechanism

Electronic, DME Direct® trading platform

Trading week

The trading week will start at 18:00 Sunday (New York Time) and will end at 17:15 Friday (New York Time).

Trading months

The current year and the next five years. A new calendar year will be added following the termination of trading in the December contract of the current year.

Minimum price fluctuation

$0.01 (1¢) per barrel ($10.00 per contract)

Maximum daily price fluctuation

None

Daily settlement

Daily settlement is at 14:30(NY time), the post close price.

A daily DME settlement price (NYMEX intraday settlement) will also be published at 16:30 Singapore Time (04:30 NY time). This can be used as the reference price by traders of Middle East Sour Crude.

No margining will take place at that time on a daily basis. However, this price, the DME final settlement price (NYMEX intraday price) will be used for margins on the last trading day of the contract month (see below).

Final settlement price

The final settlement price for a contract month will be the settlement price on the last trading day of the contract month. The final settlement price for the last trading day of the contract month will be determined as at 16:30 Singapore time (04:30 NY time) using the procedures published by the Exchange for the determination of settlement prices for the Oman Futures Contract (the final settlement price). The Exchange will publish the final settlement price on the last day of trading in that contract month. The final settlement price will be used for purposes of margins for delivery of the oil.

Last trading day

Trading terminates at the close of business on the last business day of the second month preceding the delivery month.

Settlement type

Physical

Delivery

F.O.B Seller's vessel at Mina Al Fahal Terminal, Oman, consistent with current terminal operations there. For a concise guide to the settlement procedure, please refer to the settlement and delivery mechanism.

Complete delivery rules and provisions are detailed in Chapter 10 of the Exchange Rulebook.

Loading tolerance

The oil must be delivered within a loading tolerance of plus or minus one thousand (1,000) barrels.

Alternative delivery procedure (ADP)

An ADP is available to buyers and sellers who have been matched by the Exchange subsequent to the termination of trading in the spot month contract. If buyer and seller agree to consummate delivery under terms different from those prescribed in the contract specifications, they may proceed on that basis after submitting a notice of their intention to the Exchange.

Exchange of futures for physicals (EFP)

The commercial buyer or seller may exchange a futures position for a physical position of equal quantity by submitting a notice to the Exchange. EFPs may be used to either initiate or liquidate a futures position.

Deliverable grades

The oil must be the same quality as the oil generally being supplied at the loading port at the time of loading.

Inspection

A buyer or seller may appoint an inspector to inspect the quality of oil delivered. However, the buyer or seller who requests the inspection will bear its costs and will notify the other party of the transaction that the inspection will occur.

Margin requirements

Margins are required for open futures positions and will be determined just prior to the start of trading on the DME.

Governing law

English Law

NYMEX WTI Light, Sweet Crude-Oil Futures

Trading unit

Futures: 1,000 U.S. barrels (42,000 gallons)
Options: One NYMEX WTI light, sweet crude-oil futures contract

Trading hours

Futures and options (open-outcry trading): Open:10:00 Close:14:30 the following day (NY time)

After-hours trading (via the NYMEX ACCESS® internet-based trading platform): Open: 15:15 Close: 09:00 the following day (Monday through Thursday). On Sunday, the session begins at 19:00 (NY time).

Trading months

Futures: 30 consecutive months plus long-dated futures initially listed 36, 48, 60, 72, and 84 months prior to delivery.

Trading can be executed at an average differential to the previous day's settlement prices for periods of two to 30 consecutive months in a single transaction. These calendar strips are executed during open-outcry trading hours.

Options: 12 consecutive months, plus three long-dated options at 18, 24, and 36 months out on a June/December cycle.

Price quotation

Futures and options: U.S. dollars and cents per barrel

Minimum price fluctuation

Futures and options: One cent per barrel ($10.00 per contract)

Maximum daily price fluctuation

Futures: Initial limits of $3 per barrel are in place in all but the first two months and rise to $6 per barrel if the previous day's settlement price in any back month is at the $3 limit. In the event of a move of $7.50 per barrel in either of the first two contract months, limits on all months become $7.50 per barrel from the limit in place in the direction of the move following a one-hour trading halt.

Options: Unlimited

Last trading day

Futures: Trading terminates at the close of business on the third business day prior to the 25th calendar day of the month preceding the delivery month. If the 25th calendar day of the month is a non-business day, trading ceases on the third business day prior to the last business day preceding the 25th calendar day.

Options: Trading ends three business days before the underlying futures contract

Exercise of options

By a clearing member to the Exchange clearing house not later than 17:30, or 45 minutes after the underlying futures settlement price is posted, whichever is later, on any day up to and including the option's expiry.

Options strike prices

20 strike prices in increments of 50 cents per barrel above and below the at-the-money strike price, and the next 10 strike prices in increments of $2.50 above the highest and below the lowest existing strike prices for a total of at least 61 strike prices. The at-the-money strike price is nearest to the previous day's close of the underlying futures contract. Strike-price boundaries are adjusted according to the futures price movements.

Delivery

F.O.B. seller's facility, Cushing, Oklahoma, at any pICEline or storage facility with pICEline access to TEPPCO, Cushing storage, or Equilon PICEline Co., by in-tank transfer, in-line transfer, book-out, or inter-facility transfer (pumpover).

Delivery period

All deliveries are rateable over the course of the month and must be initiated on or after the first calendar day and completed by the last calendar day of the delivery month.

Alternative delivery procedure (ADP)

An ADP is available to buyers and sellers who have been matched by the exchange subsequent to the termination of trading in the spot month contract. If buyer and seller agree to consummate delivery under terms different from those prescribed in the contract specifications, they may proceed on that basis after submitting a notice of their intention to the exchange.

Exchange of futures for, or in gonnection with, physicals (EFP)

The commercial buyer or seller may exchange a futures position for a physical position of equal quantity by submitting a notice to the exchange. EFPs may be used to either initiate or liquidate a futures position.

Deliverable grades

Specific domestic crudes with 0.42% sulfur by weight or less, not less than 37° API gravity nor more than 42° API gravity. The following domestic crude streams are deliverable: West Texas Intermediate, Low Sweet Mix, New Mexican Sweet, North Texas Sweet, Oklahoma Sweet, South Texas Sweet.

Specific foreign crudes of not less than 34° API nor more than 42° API. The following foreign streams are deliverable: U.K. Brent and Forties, and Norwegian Oseberg Blend, for which the seller will receive a 30 cents-per-barrel discount below the final settlement price. Nigerian Bonny Light and Colombian Cusiana are delivered at 15-cent premiums, and Nigerian Qua Iboe is delivered at a five-cent premium.

Inspection

Inspection shall be conducted in accordance with pICEline practices. A buyer or seller may appoint an inspector to inspect the quality of oil delivered. However, the buyer or seller who requests the inspection will bear its costs and will notify the other party of the transaction that the inspection will occur.

Position limits

20,000 contracts for all months combined, but not to exceed 1,000 in the last three days of trading in the spot month or 10,000 in any one month

Margin requirements

Margins are required for open futures or short options positions. The margin requirement for an options purchaser will never exceed the premium.

WTI Light, Sweet Crude-Oil Calendar-Spread Options

In an effort to help market participants mitigate the considerable price risk that is often present between contract months of a futures contract, the New York Mercantile Exchange introduces calendar-spread options on its light, sweet crude-oil futures contract.

The contract is simply an options contract on the price differential between two delivery dates for the same commodity. The price spread between contract months can be extremely volatile because the energy markets are more sensitive to weather and news than any other market. A widening of the month-to-month price relationships can expose market participants to severe price risk which could adversely affect the effectiveness of a hedge or the value of inventory. The calendar-spread options can allow market participants who hedge their risk to also take advantage of favorable market moves.

To put market relationships in perspective, it is necessary to keep in mind two terms which describe the price curve. When the price for a contract month nearer to the present time is higher than the price for a contract further into the future, the market is said to be in "backwardation". Typically, this means that prices are high because supplies are tight; in this case, the strike price for a calendar-spread options contract will be a positive number. Conversely, when the nearby price is less expensive than the farther-dated prices, the market is in "contango". When the price curve is in contango, strike prices of calendar-spread options contracts will be negative. A negative price is not unusual in spread relationships.

A commodity's price curve is likely to change over time. Calendar-spread options can be used to manage the exposure a business has to these changes. The risk manager for a crude-oil producer will use futures contracts to hedge production.

In contango markets, the producer, who is a seller of oil, would seek downside protection by buying puts; an oil buyer would purchase calls. A crude-oil producer with excess storage capacity can make money when the price curve is in contango by purchasing the cheaper prompt month and selling the more expensive deferred contract month.

When the markets are in backwardation, however, spare storage capacity is an asset that generates no cash flow. Selling put options on calendar spreads generates cash flow, and having the asset as a backstop enables the oil company to sell the put.

In addition, in a steeply backwardated market, it can be costly to buy back a hedge after it has appreciated in value on its way to becoming the prompt month. Buying calls on the calendar spread can reduce such costs, and can complement the short hedge by allowing for participation in the rising market.

At exercise, the buyer of a put-options contract will receive a short position in the futures market for the closer month and a long position in the futures market for the farther-dated month. The buyer of a call options contract will receive a long position in the futures market for the closer month and a short position in the futures market for the farther-dated month.

NYMEX Heating-Oil Futures

Trading unit

Futures: 42,000 U.S. gallons (1,000 barrels)
Options: One NYMEX Division heating-oil futures contract

Trading hours

Futures and options (open-outcry trading): Open: 10:05 Close: 14:30 (NY time)

After-hours futures trading (via the NYMEX ACCESS® internet-based trading platform): Open: 15:15 Close: 09:00 the following day (Monday through Thursday). On Sunday, the session begins at 19:00 (NY time).

Trading months

Futures: Trading is conducted in 18 consecutive months commencing with the next calendar month (for example, on 2 January 2002, trading occurs in all months from February 2002 through July 2003).

Options: 18 consecutive months

Price quotation

Futures and options: In U.S. dollars and cents per gallon: for example, $0.7527 (75.27¢) per gallon

Minimum price fluctuation

Futures and options: One cent per gallon ($4.20 per contract)

Maximum daily price fluctuation

Futures: Initial limits of six cents per gallon are in place in all but the first two months and rise to nine cents per gallon if the previous day's settlement price in any back month is at the six-cents-per-gallon limit. In the event of a 20-cent-per-gallon move in either of the first two contract months, limits on all months become 20 cents per gallon from the limit in place in the direction of the move following a one-hour trading halt.

Options: Unlimited

Last trading day

Futures: Trading terminates at the close of business on the last business day of the month preceding the delivery month.

Options: Trading ends three business days before the underlying futures contract.

Exercise of options

By a clearing member to the exchange clearing house not later than 17:30, or 45 minutes after the underlying futures settlement price is posted, whichever is later, on any day up to and including the option's expiry.

Options strike prices

20 strike prices in one-cent-per-gallon increments above and below the at-the-money strike price, and the next 10 strike prices in five-cent increments above the highest and below the lowest existing strike prices for a total of at least 61 strike prices. The at-the-money strike price is the nearest to the previous day's close of the underlying futures contract. Strike-price boundaries are adjusted according to the futures price movements.

Delivery

F.O.B. seller's facility in New York Harbor, ex-shore. All duties, entitlements, taxes, fees, and other charges paid. Requirements for seller's shore facility: capability to deliver into barges. Buyer may request delivery by truck, if available at the seller's facility, and pays a surcharge for truck delivery. Delivery may also be completed by pICEline, tanker, book transfer, or inter- or intra-facility transfer. Delivery must be made in accordance with applicable federal, state and local licensing and tax laws.

Delivery period

Deliveries may only be initiated the day after the fifth business day and must be completed before the last business day of the delivery month.

Alternative delivery procedure (ADP)

An ADP is available to buyers and sellers who have been matched by the exchange subsequent to the termination of trading in the spot month contract. If buyer and seller agree to consummate delivery under terms different from those prescribed in the contract specifications, they may proceed on that basis after submitting a notice of their intention to the exchange.

Exchange of futures for, or in connection with, physicals (EFP)

The commercial buyer or seller may exchange a futures position for a physical position of equal quantity by submitting a notice to the exchange. EFPs may be used to either initiate or liquidate a futures position.

Grade and quality specifications

Generally conforms to industry standards for fungible No. 2 heating oil.

Inspection

The buyer may request an inspection for grade and quality or quantity for all deliveries, but will require a quantity inspection for a barge, tanker or inter-facility transfer. If the buyer does not request a quantity inspection, the seller may request such inspection. The cost of the quantity inspection is shared equally by the buyer and seller. If the product meets grade and quality specifications, the cost of the quality inspection is shared jointly by the buyer and seller. If the product fails inspection, the cost is borne by the seller.

Position limits

7,000 contracts for all months combined, but not to exceed 1,000 in the last three days of trading in the spot month or 5,000 in any one month.

Margin requirements

Margins are required for open futures or short options positions. The margin requirement for an options purchaser will never exceed the premium.

Reformulated Gasoline Blendstock for Oxygen Blending (RBOB) Futures

Trading unit

42,000 U.S. gallons (1,000 barrels)

Price quotation

U.S. dollars and cents per gallon

Trading hours

Open-outcry trading: Open: 09:00 Close: 14:30 (NY time)
Electronic trading (via the CME Globex® trading platform) Open: 18:00 Close: 17:15 the following day (Sunday through Friday).

Trading months

36 consecutive months on a rolling basis

Trading at settlement (TAS)

Trading at settlement is available for the front two months except on the last trading day and is subject to the existing TAS rules. Trading in all TAS products will cease daily at 14:30 Eastern Time. The TAS products will trade off of a "Base Price" of 100 to create a differential (plus or minus) in points off settlement in the underlying cleared product on a one-to-one basis. A trade done at the Base Price of 100 will correspond to a "traditional" TAS trade which will clear exactly at the final settlement price of the day.

Minimum price fluctuation

$0.0001 (0.01¢) per gallon ($4.20 per contract)

Maximum daily price fluctuation

$0.25 per gallon ($10,500 per contract) for all months. If any contract is traded, bid, or offered at the limit for five minutes, trading is halted for five minutes. When trading resumes, the limit is expanded by $0.25 per gallon in either direction. If another halt were triggered, the market would continue to be expanded by $0.25 per gallon in either direction after each successive five-minute trading halt. There will be no maximum price fluctuation limits during any one trading session.

Last trading day

Trading terminates at the close of business on the last business day of the month preceding the delivery month.

Settlement type

Physical

Delivery

F.O.B. seller's facility in New York Harbor, ex-shore. All duties, entitlements, taxes, fees, and other charges paid. Requirements for seller's shore facility: capability to deliver into barges. Delivery may also be completed by pipeline, tanker, book transfer, or inter- or intra-facility transfer. Delivery must be made in accordance with applicable federal, state and local licensing and tax laws. Delivery must comply with all state laws related to oxygen content.

Complete delivery rules and provisions are detailed in Chapter 191 of the Exchange Rulebook.

Delivery period

Deliveries may only be initiated the day after the fifth business day and must be completed before the last business day of the delivery month.

Alternative Delivery Procedure (ADP)

An ADP is available to buyers and sellers who have been matched by the Exchange subsequent to the termination of trading in the spot month contract. If buyer and seller agree to consummate delivery under terms different from those prescribed in the contract specifications, they may proceed on that basis after submitting a notice of their intention to the Exchange.

Exchange of futures for physicals (EFP)

The commercial buyer or seller may exchange a futures position for a physical position of equal quantity by submitting a notice to the Exchange. EFPs may be used to either initiate or liquidate a futures position.

Grade and quality specifications

Generally conforms to industry standards for reformulated regular gasoline blendstock for oxygen blending (RBOB) with 10% denatured fuel ethanol (92% purity) as listed by the Colonial Pipeline for fungible F grade for sales in New York and New Jersey. RBOB is a wholesale non-oxygentated blendstock traded in the New York Harbor barge market that is ready for the addition of 10% ethanol at the truck rack.

NYMEX Henry Hub Natural-Gas Futures & Options

Trading unit

Futures: 10,000 million British thermal units (mmBtu)
Options: One NYMEX Division natural-gas futures contract

Trading hours

Futures and options (open-outcry trading): Open: 10:00 Close: 14:30 or at 14:45 on any futures termination day that falls on a Wednesday (NY time)

After-hours futures trading (conducted via the NYMEX ACCESS® internet-based trading platform): Open: 15:15 Close: 09:00 the following day (Monday through Thursday)

On Sundays, the session begins at 19:00 (NY time).

Trading months

Futures: 72 consecutive months commencing with the next calendar month (for example, on 2 January 2002, trading occurs in all months from February 2002 through January 2008)

Options: 12 consecutive months, plus contracts initially listed 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69 and 72 months out on a March, June, September, December cycle

Price quotation

Futures and options: U.S. dollars and cents per mmBtu (for example, $2.850 per mmBtu)

Minimum price fluctuation

Futures and options: $0.001 (0.1 ¢) per mmBtu ($10.00 per contract)

Maximum daily price fluctuation

Futures: $1 per mmBtu ($10,000 per contract) for all months. If any contract is traded, bid or offered at the limit for five minutes, trading is halted for 15 minutes. When trading resumes, expanded limits are in place that allow the price to fluctuate by $2 in either direction of the previous day's settlement price. There are no price limits on any month during the last three days of trading in the spot month.

Options: Unlimited

Last trading day

Futures: Trading terminates three business days prior to the first calendar day of the delivery month.

Options: Trading terminates at the close of business on the business day immediately preceding the expiry of the underlying futures contract.

Exercise of options

By a clearing member to the exchange clearing house not later than 17:30 or 45 minutes after the underlying futures settlement price is posted, whichever is later, on any day up to and including the option's expiry.

Option strike prices

20 strike prices in increments of five cents per mmBtu above and below the at-the-money strike price in all months, plus an additional 20 strike prices in increments of five cents per mmBtu above the at-the-money price will be offered in the first three nearby months, and the next 10 strike prices in increments of 25 cents per mmBtu above the highest and below the lowest existing strike prices in all months for a total of at least 81 strike prices in the first three nearby months and a total of at least 61 strike prices for four months and beyond. The at-the-money strike price is nearest to the previous day's close of the underlying

futures contract. Strike-price boundaries are adjusted according to futures price movements.

Delivery location

Sabine PICE Line Co.'s Henry Hub in Louisiana. Seller is responsible for the movement of the gas through the Hub; the buyer, from the Hub. The Hub fee will be paid by seller.

Delivery period

Delivery to take place no earlier than the first calendar day of the delivery month and be completed no later than the last calendar day of the delivery month. All deliveries to be made at as uniform as possible an hourly and daily rate of flow over the course of the delivery month.

Alternative Delivery Procedure (ADP)

An ADP is available to buyers and sellers who have been matched by the exchange subsequent to the termination of trading in the spot month contract. If buyer and seller agree to consummate delivery under terms different from those prescribed in the contract specifications, they may proceed on that basis after submitting a notice of their intention to the exchange.

Exchange of futures for, or in connection with, physicals (EFP) or swaps (EFS)

The commercial buyer or seller may exchange a futures position for a physical position or a swaps position of equal quantity by submitting a notice to the exchange. EFPs and EFSs may be used to either initiate or liquidate a futures position.

Quality specifications

PICEline specifications in effect at time of delivery.

Position limits

7,000 contracts for all months combined, but not to exceed 1,000 in the last three days of trading in the spot month or 5,000 in any one month.

TOCOM Tokyo Commodity Exchange
Mid East Crude-Oil Futures Contract

Date of listing

10 September 2001

Type of crude oil

Middle East crude oil (the average value of Dubai and Oman, which acts as the benchmark price)

Contract unit

100 kl

Trading method

Computerized continuous trading

Price quotation

Japanese yen per kiloliter

Minimum price fluctuation

¥10 per 1 kiloliter

Daily price fluctuation limit

Standard price (an average of the closing prices on the preceding business day for all contract months except the current contract month)

Price limit

Less than ¥6,000	¥300 per kl
¥6,000–¥12,000	¥500 per kl
¥12,000–¥18,000	¥700 per kl
¥18,000 and over	¥900 per kl

The exchange may change the price limit at its discretion, according to the market situation.

Customer position limit (long position and short position each)

Current contract month:
40 contracts: on and after the 10th of each month (or the first business day thereafter if the 10th falls on a weekend/holiday)

80 contracts: from the first business day to the ninth of each month
Second contract month: 160 contracts
Third contract month: 400 contracts
Other contract months: 800 contracts each month.
Total: 2,400 contracts

Initial customer margin

Standard price*	margin**
Less than ¥6,000	¥45,000 per contract
¥6,000–¥12,000	¥75,000 per contract
¥12,000–¥18,000	¥105,000 per contract
¥18,000 and over	¥135,000 per contract

* A monthly average of closing prices for all contract months except the last three business days in the previous month.
** The margins quoted are minimum amounts determined by the Minister of Economy, Trade and Industry. The exchange is entitled to set greater amounts.

Customer trading commission to futures clearing merchants*

¥3,800**

* Commissions are negotiable (1) between originating and clearing FCMs of an omnibus account; (2) between an FCM and a customer where orders are transmitted electronically and the registration for the exemption from fixed-commission rate is made to the exchange by the FCM; or (3) for customers who market, produce or process physical commodities (that is, commercials).

When the volume of customer's executed contracts exceeds 1,000 contracts per trade or delivery, commission to FCMs on the exceeded amount is discounted by 30%. Day trade, omnibus positions, fund positions and positions established by commercials are not applicable.
** This commission rate is charged per side per contract, except in the case of a day trade, where the above rate is charged as roundturn fee, the charge made for buying and selling one futures contract.

Trading hours

Open: 09:00 Close:11:00 Open: 12:30 Close: 15:30

Contract months

Six consecutive months from the current contract month

Last trading day*

January–November: the third business day prior to the last business day

December: the third business day prior to either the 24th or the business day immediately preceding the 24th if it falls on a weekend/holiday

* On the last trading day, those who hold positions in the current contract month must liquidate all of their positions by placing market orders at the opening of the market. No new position is allowed to be established on the last trading day.

Delivery

Cash settlement (no delivery)

Final settlement price

Yen-based average value of Dubai and Oman calculated by the exchange based on the prices reported by Reuters, Bloomberg, Petroleum Argus, ICIS-LOR, Rim Intelligence and Telerate

TOCOM also lists a futures contract for kerosene and gasoline, which can be utilized to hedge the domestic Japanese market. It should be noted that, at the time of writing, the general understanding is that the majority of the volume traded in these contracts, including the crude-oil contract, is speculative volume from retail investors. This may affect the correlation of the futures contracts with the underlying physical markets.

TOCOM Futures Contract Specifications — Kerosene

Date of Listing

5 July 1999

Standard

Kerosene of JIS K2203 Grade 1

Contract unit

100 kl

Delivery unit

100 kl

Trading method

Computerized continuous trading

Price quotation

Yen per kiloliter

Minimum price fluctuation

¥10 per 1 kiloliter

Daily price fluctuation limit

Standard price*	limit**
Less than ¥17,000	¥400 per kl
¥17,000–¥24,000	¥500 per kl
¥24,000–¥31,000	¥600 per kl
¥31,000 and over	¥700 per kl

* An average of the closing prices on the preceding business day for all contract months except the current contract month.
** The exchange may change the price limit at its discretion, according to the market situation.

Customer position limit (long position and short position each)

Current contract month: 70 contracts
Second contract month: 200 contracts
Third contract month: 600 contracts
Other contract months: 1,200 contracts each month
Total: 4,000 contracts

Initial customer margin

Standard price*	margin**
Less than ¥17,000	¥60,000 per contract
¥17,000–¥24,000	¥75,000 per contract
¥24,000–¥31,000	¥90,000 per contract
¥31,000 and over	¥105,000 per contract

* A monthly average of closing prices for all contract months except the last three business days in the previous month.
** The margins quoted are minimum amounts determined by the Minister of Economy, Trade and Industry.

Commission to FCMs*

¥3,800 (per contract)

* The above commission rate is charged per side per contract, except in the case of a day trade, where the above rate is charged as roundturn fee.

Commissions are negotiable (1) between originating and clearing FCMs of an omnibus account; (2) between an FCM and a customer where orders are transmitted electronically and the registration for the exemption from fixed-commission rate is made to the exchange by the FCM; or (3) for customers who market, produce or process physical commodities (that is, commercials).

When the volume of a customer's executed contracts exceeds 1,000 contracts per trade or delivery, commission to Futures Clearing Merchants on the exceeded amount is discounted by 30%. Day trade, omnibus positions, fund positions and positions established by commercials are not applicable.

Delivery commission to FCMs

As above

Trading hours

Open: 09:00 Close:11:00 Open: 12:30 Close: 15:30

Contract months

Six consecutive months from the current contract month

Last trading day

The 20th of the month preceding the delivery month

Delivery period

Throughout the delivery month

Delivery points

Refineries and oil tanks located in Tokyo, Kanagawa and Chiba, provided with both barge- and lorry-delivery facilities, and appointed by the Board of TOCOM (In case of delivery into lorry, buyers are obliged to pay the surcharge decided by the Board.)

Delivery

Physical delivery (not cash settlement)

Deliverable commodities

Kerosene of JIS K2203 Grade 1, which is refined within Japan or cleared through the customs.

Contract price and tax

The contract price is inclusive of the cost of delivery into barges in refineries or oil tanks located in the Tokyo Bay area, but exclusive of consumption tax.

Delivery method

(1) Option of delivery points: seller
(2) Delivery method: delivery into barge or lorry
(3) Option of delivery method: buyer
(4) Option of delivery day: buyer in principle
(5) Matching of buyer and seller: Determined by drawing lots, except when parties to delivery find their counterparties by themselves during the period from last trading day to the day the exchange draws lots.

Quantity tolerance on delivery

±2% of the volume per delivery

TOCOM Futures Contract Specifications — Gasoline

Date of listing

5 July 1999

Standard

Regular gasoline of JIS K2202 Grade 2

Contract unit

100 kl

Delivery unit

100 kl

Trading method

Computerized continuous trading

Price quotation

Yen per kiloliter

Minimum price fluctuation

¥10 per 1 kiloliter

Daily price fluctuation limit

Standard price (an average of the closing prices on the preceding business day for all contract months except the nearest contract month)

Price limit

Less than ¥17,000	¥400 per kl
¥17,000–¥22,000	¥500 per kl
¥22,000–¥27,000	¥600 per kl
¥27,000 and over	¥700 per kl

The exchange may change the amount of the price limit at its discretion, according to the market situation.

Customer position limit (long position and short position each)

Current contract month: 100 contracts
Second contract month: 200 contracts
Third contract month: 600 contracts
Other contract months: 1,200 contracts each month
Total: 4,000 contracts

Initial customer margin

Standard price* margin**
Less than ¥17,000 ¥60,000 per contract
¥17,000 to less than ¥22,000 ¥75,000 per contract
¥22,000 to less than ¥27,000 ¥90,000 per contract
¥27,000 and over ¥105,000 per contract

* A monthly average of closing prices for all contract months except the last three business days in the previous month.
** The margins quoted are minimum amounts determined by the Minister of Economy, Trade and Industry. The exchange is entitled to set greater amounts. Check Tokyo Commodity Exchange (TOCOM) website

Customer trading commission to FCMs*

¥3,800 (per contract)

* The above commission rate is charged per side per contract, except in the case of a day trade, where the above rate is charged as roundturn fee, the cost of buying and selling one futures contract.

Commissions are negotiable (1) between originating and clearing FCMs of an omnibus account; (2) between an FCM and a customer where orders are transmitted electronically and the registration for the exemption from fixed-commission rate is made to the exchange by the FCM; or (3) for customers who market, produce or process physical commodities (that is, commercials).

When the volume of a customer's executed contracts exceeds 1,000 contracts per trade or delivery, commission to FCMs on the exceeded amount is discounted by 30%. Day trade, omnibus positions, fund positions and positions established by commercials are not applicable.

Customer delivery commission to FCMs

As above

Trading hours

Open: 9:00 Close:11:00 Open:12:30 Close: 15:30

Contract months

Six consecutive months from the current contract month

Last trading day

The 20th of the month preceding the delivery month

Delivery period

Throughout the delivery month

Delivery points

Refineries and oil tanks located in Tokyo, Kanagawa and Chiba, provided with both barge- and lorry-delivery facilities, and appointed by the Board of TOCOM (In cases of delivery into lorry, buyers are obliged to pay the surcharge decided by the Board.)

Delivery

Physical delivery (not cash settlement)

Deliverable quality of gasoline

Regular gasoline of JIS K2202 Grade 2, refined within Japan or cleared through the customs.

As contract price does not include gasoline tax, buyers must pay the sellers the amount equivalent to the gasoline tax when taking delivery.

Contract price and tax

The contract price is to be inclusive of the cost of delivery into barges in refineries or oil tanks located in the Tokyo Bay area but exclusive of gasoline tax and consumption tax.

Delivery method

(1) Option of delivery points: seller
(2) Delivery into barge or lorry
(3) Option of delivery method: buyer
(4) Option of delivery day: buyer in principle
(5) Matching of buyer and seller: Determined by drawing lots, except when parties to deliver find their counterparties by themselves during the period from last trading day to the day the exchange draws lots.

Quantity tolerance on delivery

±2% of the volume per delivery

COAL FUTURES

The United States has more high-quality coal than any other country, with nearly 30% of the world's bituminous and anthracite coal reserves. Only China produces more bituminous coal than the United States, but almost all of its production is consumed domestically. U.S. coal exports, chiefly central Appalachian bituminous, make up 16% of the world export market and are an important factor in world coal prices. At current rates of recovery and use, it is estimated that U.S. coal reserves will last more than 250 years. The importance of coal can be seen from the fact that coal-fired power stations still account for approximately 55% of total electricity output in the U.S.

Because coal is a bulk commodity, transportation is an important aspect of its price and availability. Railroads carry more than half of the coal mined in the United States, often hauling the coal in unit trains. Unit trains, with several locomotives pulling anywhere from 60 to 120 cars loaded solely with coal, are a common sight in both Appalachia and the western United States. The inland waterway system is the other major mode for coal transportation, especially along the Ohio and Mississippi rivers.

The impact on the environment of coal use is a serious issue. Any effort to curtail atmospheric emissions can be expected to involve reduced coal use, even though the amount of air pollution produced by coal burning has been greatly diminished during the past 30 years. For example, while the volume of coal used by electric utilities leapt from 320 million tons in 1970 to nearly a billion tons in the late 1990s, an increase of more than 200%, sulfur dioxide emissions from coal-fired plants declined 27%.

Coal prices are still mainly traded in the OTC market; however, for both the U.S. coal mining and electric-power industries, NYMEX Coal Futures provide a range of ways to mitigate risk. For the international coal-trading or -consuming market, it can also offer another tool for price monitoring and price-risk mitigation, perhaps on an arbitrage basis with European or other regional OTC hedging markets (for example, United Kingdom-based OTC swaps on coal grade API2).

Coal producers can sell futures contracts to lock in a specific sales price for a specific volume of the coal they intend to produce in coming months. Electric utilities can buy coal futures to hedge against rising prices for their baseload fuel. Power marketers, who have exposure on both the generating and delivery sides of the electricity market, can hedge with coal futures to mitigate their generation-price risk, and hedge with electricity futures to control their delivery-price risk. Non-utility industrial coal-users, such as steel mills, can use futures to lock in their own supply costs. International coal-trading companies can use futures to hedge their export or import prices. Power-generating companies that use both coal and natural gas to produce electricity can use coal futures in conjunction with the NYMEX Henry Hub natural-gas futures to offset seasonal cost variations and to take advantage of the "spark spread" — the differential between the cost of the two fuels and the relative value of the electricity generated by each of the two fuels.

Useful physical coal-market price information and analysis can be obtained from Argus (www.argusonline.com).

Central Appalachian Coal Futures

Trading symbol

QL

Trading unit

1,550 tons of coal

Trading hours

Open: 10:30 Close: 14:00 (NY time) (open-outcry trading)

Trading months

24 to 26 consecutive months based on a quarterly schedule. As contracts expire, the 26th month will roll forward until it becomes the 23rd month. At that point, new 24th, 25th, and 26th month contracts will be added.

Price quotations

U.S. dollars and cents per ton

Minimum price fluctuation

One cent per ton ($15.50 per contract)

Maximum price fluctuation

$12 per ton ($18,600 per contract) for all months. If any contract is traded, bid or offered at the limit for five minutes, trading is halted for 10 minutes. When trading resumes, expanded limits are in place that allow the price to fluctuate by $24 in either direction of the previous day's settlement price. There are no price limits on any month during the last three days of trading in the spot month.

Last trading day

Trading terminates on the fourth-to-last business day of the month prior to the delivery month.

Contract delivery unit

The seller will deliver 1,550 tons of coal per contract. A loading tolerance of 60 tons or 2%, whichever is greater, over the total number of contracts delivered is permitted.

Delivery location

Delivery to be made F.O.B. buyer's barge at seller's delivery facility on the Ohio River between Mileposts 306 and 317, or on the Big Sandy River, with all duties, entitlements, taxes, fees and other charges imposed prior to delivery paid by the seller. There will be a discount of 10 cents per ton below the final settlement price for any delivery to a terminal on the Big Sandy River.

Heat content

Minimum of 12,000 Btus per pound, gross calorific value, with an analysis tolerance of 250 Btus per pound below.

Ash content

Maximum of 13.50% by weight with no analysis tolerance

Sulfur content

Maximum of 1%, with analysis tolerance of 0.050% above

Moisture content

Maximum of 10%, with no analysis tolerance

Volatile matter

Minimum of 30%, with no analysis tolerance

Hardness/grindability

Minimum 41 Hardgrove Index with three point analysis tolerance below (Hardness measures how difficult it is to pulverize coal for injection into the boiler flame.)

Size

Three inches topsize, nominal, with a maximum of 55% passing one-quarter-inch-square wire cloth sieve or smaller, to be determined on the basis of the primary cutter of the mechanical sampling system.

Exchange of futures for, or in connection with, physicals (EFP)

The buyer or seller may exchange a futures position for a physical position of equal quantity/quality by submitting a notice to the exchange. EFPs may be used either to initiate or liquidate a futures position. The EFP deadline is 10:00 (NY time) on the first business day following termination of trading.

Position accountability level

Any one month/all months: 5,000 net futures, but not to exceed 200 in the last three days of trading in the spot month.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 4

Pricing Middle East Crude in the Next Century

Taimur Hadi*
Edited by Tom James

INTRODUCTION

The world's biggest futures market for trading the price of oil is currently to be found in New York, at the New York Mercantile Exchange (NYMEX). The second-biggest is in London at the Intercontinental Exchange (ICE), formerly the International Petroleum Exchange. Despite the fact that over 60% of the world's proven oil reserves are in the Middle East, over 60% of the world's oil is currently priced against the low-sulfur, sweet crude Brent Futures contract traded in London.

The world's first oil futures contract was launched on NYMEX in 1979. Since then, it has been noticeable that the price-discovery mechanism for Middle East sour crude has not developed in tandem with its sweet-crude counterparts in the West.

In a global economy which depends extensively on crude oil, and increasingly on Middle East sour crude oil as the primary source of energy, it is important to understand the process through which the price of this valuable commodity is established.

This chapter focuses on the increasing energy interdependence between the Middle East and the rapidly growing Asian economies of China and India, and examines the resulting need for better price

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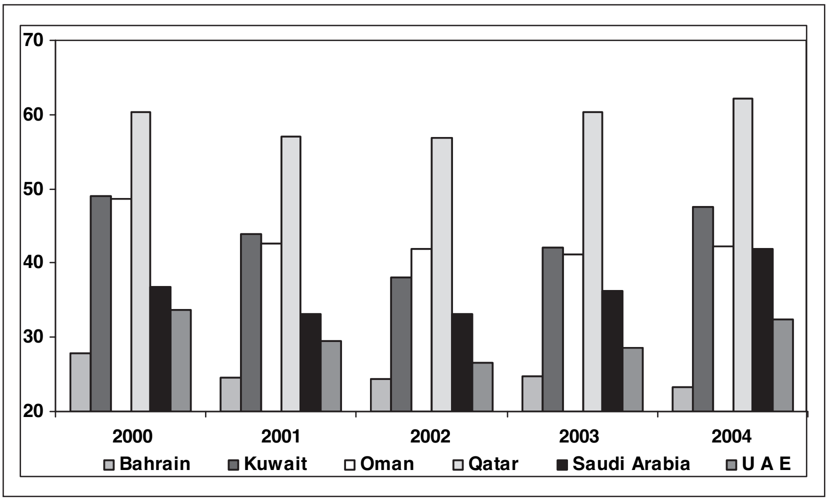
discovery in Middle East crude oil. It also explores how the current process is expected to change over time against a backdrop of some unprecedented regional and international developments.

A FAIR PRICE

Despite the fact that crude-oil prices dominate global news headlines, most outside the oil and gas industry (and even many within it) are unaware of how the price of crude oil is determined. Does the Organization of Petroleum Exporting Countries (OPEC) set the price of crude oil? What do the terms "WT", "Brent" and "Dubai" stand for and why do their prices fluctuate so much? It is probably appropriate to say that in spite of our growing dependence on crude oil, most people remain unaware of the mechanisms behind the pricing of it, especially of the oil flowing from the Middle East towards Asian economies.

We begin our study of Middle East crude-oil pricing by acknowledging that the perpetual quest for buyers or consumers of crude oil is to obtain the hydrocarbon at a "fair price". For buyers such as crude-oil refineries in Asia, that fair price reflects the cost at which they can profitably convert crude oil into petroleum products for use by end-consumers (for example, jet fuel for airlines, gasoline for automobile owners). For end-consumers who purchase refined energy products, such as heating oil or gasoline, the fair price is one which helps them sustain current levels of consumption without disrupting their quality of life too greatly, enabling them to run factories, heat homes and offices, and breathe life into existing and developing transportation systems. In countries such as China and India, end-consumers may be protected from international crude-oil price movements through energy subsidies on certain refined products and on the cost of electricity. However, other countries, such as Japan, do not offer such protection, passing price increases onto the end-consumer. Japan does not shield end-users from increasing oil prices, the result of which has been "an erosion of demand for domestic products, especially gasoline".[1] The objective of the consumer or buyer of sour crude oil is to secure long-term supplies cost-effectively without damaging economic growth.

For sellers or producers of sour crude oil, the fair price must adequately cover the costs of exploration, production and transportation. Furthermore, the fair price must be sustainable over the long term in order to secure much-needed funding for national budgets, especially for deployment in critical sectors such as education, healthcare and infrastructure. According to a recent International Monetary Fund



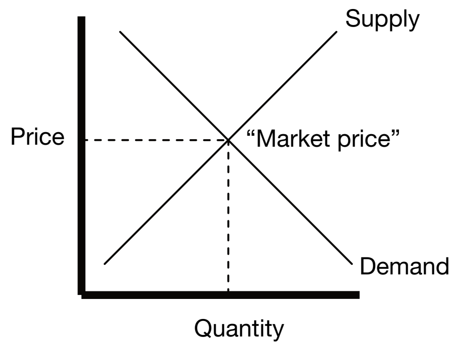
Source: Gulf Investment Corporation, 2005

FIGURE 4.1 Oil and gas production as a percentage of GDP

report on the Arab Gulf countries, "the Gulf Cooperative Council's (GCC) investment plans for 2006–2010 amount to over US$700 billion — covering investments in the oil and gas sector, infrastructure, and real estate".[2] Most of the funding for such expenditures will come from revenues associated with oil and gas sales. Oil and gas revenues currently represent up to 60% of gross domestic product (GDP) for certain Arab Gulf countries.[3] (See Figure 4.1.)

Preoccupied with setting fair prices for their crude-oil sales, and in order to avoid association with price movements and fluctuations, especially in relation to price upswings, Arab producers do not trade directly in the crude-oil markets, unlike many of their customers in Asia. Commenting on the pricing objectives of Middle East crude-oil producers, Ali Obaid Al Yabhouni, head of marketing and research at the Abu Dhabi National Oil Company (Adnoc) is reported as saying: "In fact, they [producers] are concerned about the future of oil demand... as we [producers] want to see continued strong global economic growth and do not want the growth of developing countries to get sluggish."[4] After all, for a region which derives the majority of its sustenance from oil revenues, it is important for the Middle East to meet the security-of-supply concerns of oil-thirsty Asian customers.

If buyers and sellers of sour crude oil are interested in transacting at a "fair price", then it must reflect basic market supply-and-demand fundamentals. In macroeconomic terms, this fair price is also known as the market price, and is established at the intersection of the crude-oil supply-and-demand curves (see Figure 4.2). The price of crude oil is highly volatile and subject to a multitude of economic, social, political and environmental factors. As a result, it is critical for both producers and consumers that the price-discovery process — a process by which a price is established and reported — be flexible and robust, in order to reflect quickly ongoing changes in supply-and-demand fundamentals. The pricing mechanism must also be transparent and well regulated so that it is not easily manipulated and capable of retaining the confidence of all market participants. Finally, it must be representative of the market or the commodity it is pricing (this will be discussed later in the context of sweet and sour crude oil).



Determinants of crude-oil supply

- Proven reserves, production levels (including observed OPEC quotas for member countries)
- Investment in upstream technologies; exploration and production processes; resulting efficiency
- Potential supply disruptions due to weather/natural disasters or political instability/acts of war
- Discovery of new crude-oil reserves, improvement in existing/new reserve yields

Determinants of crude-oil demand

- Crude-oil consumption rates; growth in GDP, population growth, industrialization and urbanization of developing economies
- Development of alternative and renewable energy options (gas, coal, wind, solar etc.)
- Implementation of fuel-efficient technologies (hybrid cars, LNG infrastructure)
- Refining and storage capacity

FIGURE 4.2 Basic supply and demand curves

CAUSE FOR CHANGE

A comparison of the price-discovery process between sweet and sour crude-oil benchmarks is necessary for pointing out the imbalance in global crude-oil pricing, and will help highlight the shortfalls of the current pricing mechanism for Middle East crude oil sold into Asia, also known as the East of Suez oil market. The difference between sweet and sour crude oil primarily relates to the sulfur content of the crude and is discussed later in detail (sour crude oil has more than 0.5% sulfur content). Although they are both hydrocarbons, sweet and sour crude oils are considered different commodities. The two international sweet crude-oil benchmarks are West Texas Intermediate (commonly referred to as "WTI") and Brent, Forties, Oseberg (referred to collectively as "Brent" or "BFO"). Both WTI and Brent benchmarks are established through transparent futures markets in New York and London, where thousands of market participants trade in a financially regulated environment in order to establish a fair market price. Daily trading volumes are in the hundreds of thousands of contracts. In contrast with its sweet crude counterparts, the pricing benchmark for sour crude is neither liquid nor transparent and trades in a completely unregulated pricing environment.

Dubai, the major sour crude-oil price benchmark, is based off the Fateh crude-oil stream. Its price is derived through an assessment of trading activity in both physical cargoes and financial swaps in the over-the-counter (OTC) markets in Singapore by price-reporting agencies such as Platts or Argus. An OTC contract is a bilateral contract in which two parties agree on how a particular trade or agreement is to be settled in the future. For derivatives, these agreements are usually governed by the International Swaps and Derivatives Association agreement.[5] The price-reporting agencies have different methodologies for assessing prices and rely heavily upon information captured by various OTC financial instruments used by buyers of Middle East crude oil for hedging purposes. These financial instruments include the Brent-Dubai swap and a widely traded financial instrument known as an "exchange of futures for swap" (EFS) contract.

The Dubai crude-oil benchmark is very important as it is utilized by Middle East crude oil producers in pricing over 12 million barrels of crude sales to Asia. However, given the continuous decline in production of Dubai (Fateh) crude oil to less than 100,000 barrels per day, there are significant challenges in maintaining Dubai's role as the sour crude-oil pricing benchmark. Over the past few years, price-reporting agencies have taken several steps to try to restore liquidity and confidence in the East of Suez pricing mechanism. First, Platts included the price of Oman crude-oil cargoes in the price assessment for Dubai crude (also known as the Dubai-Oman average) to ensure greater liquidity and prevent possible market manipulation. Similar to Dubai crude-oil sales, Oman sales are also destination-free, which means that they can be freely traded in the open market and are therefore better proxies for reflecting market supply-and-demand conditions. Most other Middle East crude-oil sales, by contrast, are destination-restricted (where sales are usually restricted to refineries), and therefore cannot be traded in the open market. Trading in the underlying commodity gives Dubai and Oman a distinct advantage in becoming pricing benchmarks relative to non-traded crude streams. Next, in an attempt to bolster transparency and encourage industry participation, Platts created a pricing window (the Platts window) during which smaller "partials" or 25,000 barrel-trades take place during a 30-minute period at the end of the Singapore trading day. Finally, and most recently, in 2006 Platts introduced another crude-oil stream, Upper Zakum crude oil from Abu Dhabi, as yet another substitute for enhancing liquidity in the Dubai-Oman price assessment. However, despite these efforts to increase liquidity and transparency in oil pricing, the OTC-based pricing mechanism remains inferior to that of the futures market, creating a need for change in the way Middle East sour crude oil is priced.

The delay in the development and sophistication of Middle East sour crude-oil pricing mechanisms, compared to Western counterparts, is due to a number of key factors. These include:

- over-dependence on the Singapore OTC market for sour crude-oil price assessments
- historically slow acceptance of futures and options by Middle East producers and consumers as legitimate mechanisms for risk management
- the absence of the regulatory and exchange infrastructure necessary to facilitate price transparency in futures markets
- the relative ease of maintaining the status quo in a market supported by increasing crude-oil prices.

However, as the Arab Gulf region continues to develop economically, in large part due to reinvestment of crude-oil revenues in key sectors such as education, healthcare, infrastructure and technology, several catalysts are propelling the region towards a new pricing paradigm. The change in the way Middle East crude oil is priced is accelerated by the following catalysts:

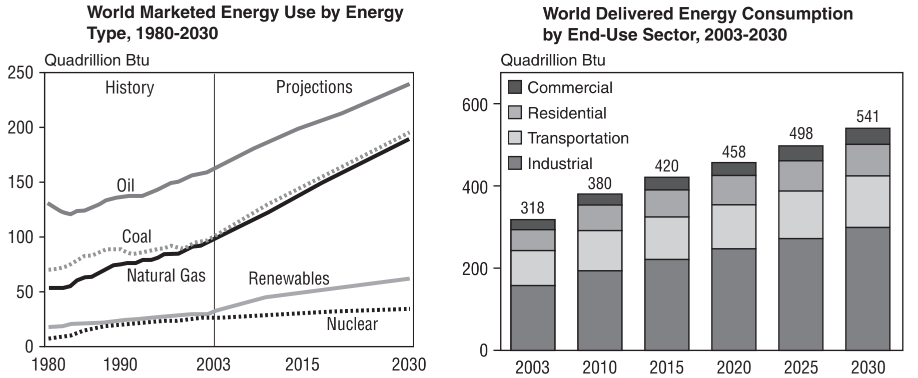
- increasing price volatility in crude-oil markets, which accelerates the need for managing price risk
- a decline in production of the region's main crude-oil benchmark, Dubai, which require its replacement with an underlying crude oil that has sufficient production
- the need for better pricing information by both producers and consumers in order to plan and manage forward budgets
- a lack of confidence in unregulated OTC markets in which parties trade bilaterally with each other; related counterparty-credit concerns
- the gradual increase in sophistication of the region's financial markets
- the creation of a foundation to facilitate price discovery; technologically enabled commodities exchanges, world-class regulatory bodies and government support for change.

Sour crude-oil pricing, which is of primary interest to major Arab Gulf producers and major Asian consumers, has reached an important point in its cycle of development. The East of Suez market is striving to find a new pricing mechanism comparable to the sweet crude-oil futures benchmarks of the West. For producers to set official selling prices and for consumers to hedge and manage price risk using a futures benchmark, the minimum criterion is a sour crude-oil price-discovery mechanism that is representative of the region's crude oil, robust in its trading volumes, transparent, free of price manipulation, reflective of supply-and-demand dynamics and easy to use.

ASIAN DEMAND, MIDDLE EAST SUPPLY AND GROWING INTERDEPENDENCE

• Crude-oil demand

The global demand for crude oil has not abated despite the introduction of technological improvements in harnessing renewable and alternative energy, transporting natural gas and the use of "clean coal" technology. Crude oil remains the largest and most ubiquitous source of energy in the world today. According to forecasts by the U.S.-based Energy Information Administration (EIA), crude oil will continue to remain the predominant source of energy well into 2030, with most of its consumption driven by industrial and transportation sectors.[6] (See Figure 4.3.)



Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, System for the Analysis of Global Energy Markets (2006).

Sources: **2003:** Derived from Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **2010-2030:** EIA, System for the Analysis of Global Energy Markets (2006).

FIGURE 4.3 Crude-oil consumption and key end-sector uses

Crude oil consumption has grown by 40% in the last two decades, to a staggering 82.5 million barrels per day in 2005.[7] This number will increase further by nearly 50%, to approximately 118 million bpd in 2030. Most of the increase, about 43%, will come from Asian countries such as India and China, which are outside the Organization for Economic Cooperation and Development (OECD).[8] (See Figure 4.4.) The growth in consumption is based on a myriad of factors, ranging from increased industrialization and urbanization to population growth.

To meet growing demand, the incremental increase in crude-oil supply for the foreseeable future will come from the Arab Gulf states. The ability of Arab oil producers to supply the incremental crude oil depends greatly on production yields from existing reserves, the discovery and development of new oil fields, improvements in upstream and downstream technologies, reinvestment in existing and new infrastructure, stable political conditions and weather patterns conducive for drilling, extraction and transportation. According to findings from the International Energy Agency's (IEA) World Energy Outlook Report 2005, "the level of upstream oil investment required will be more than twice that of the last decade".[9] As the region's share in global oil production increases from 35% in 2005 to 44% in 2030, countries of the Middle East and North Africa (MENA) will need to invest, on average, US$56 billion per year in energy infrastructure.[10]

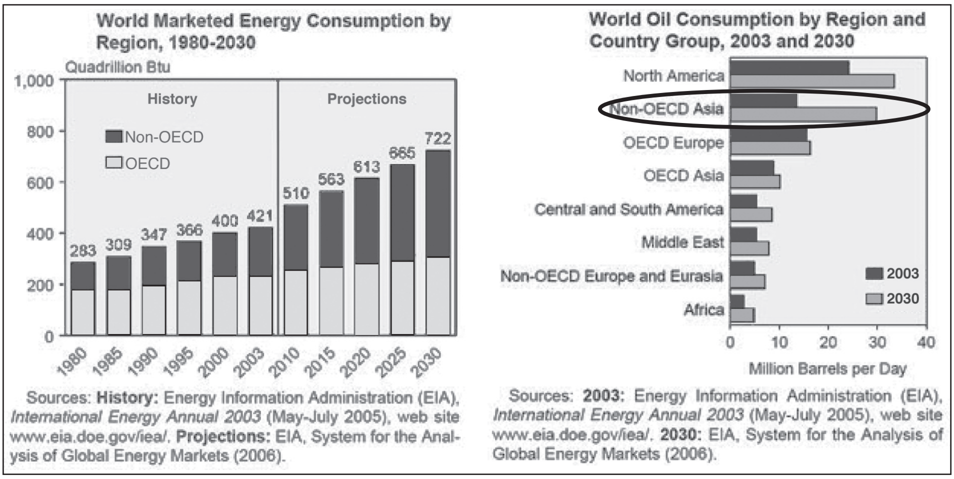
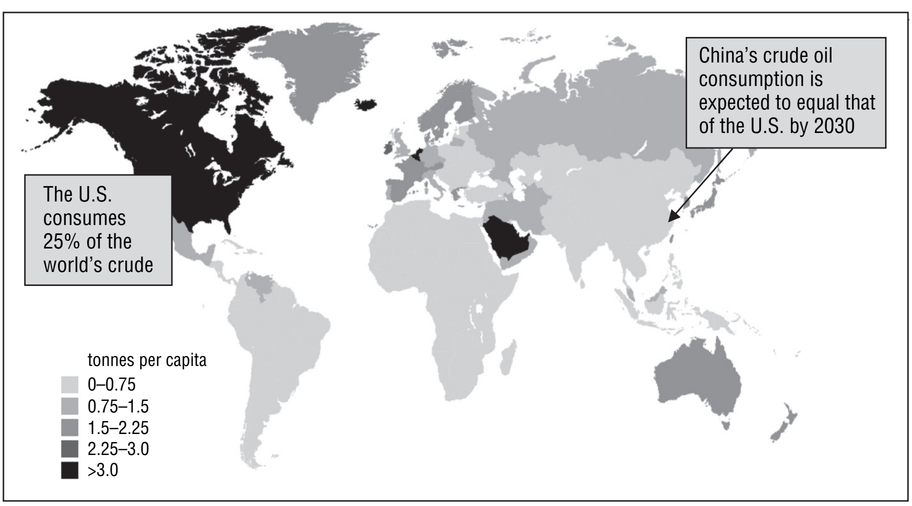


FIGURE 4.4 Growth in energy consumption

On a population and proven crude-oil reserve basis, North America, and especially the United States, today consumes a disproportionately greater portion of the world's crude oil. While home to only 2.4% of the world's total crude-oil reserves and just under 5% of the world's population, the United States consumes 24.6% of the world's crude-oil supply (see Figure 4.5).[11] However, as emerging markets, especially those of China and India, with a combined population of over 2.38 billion



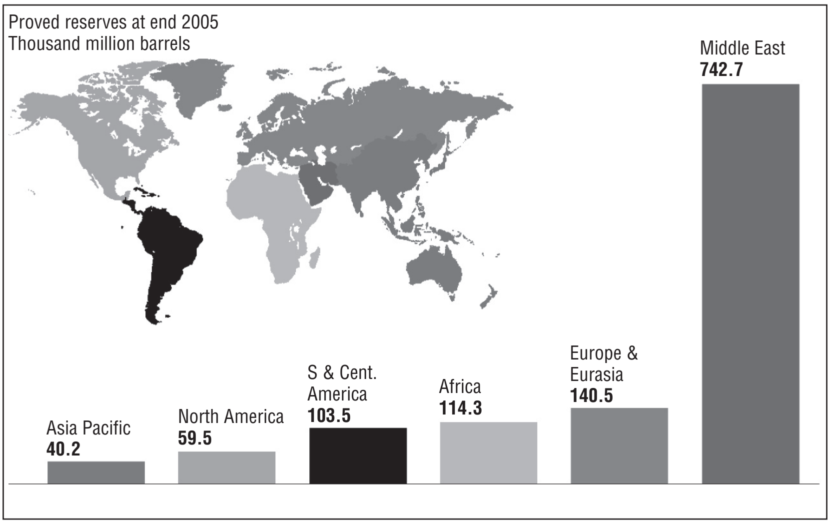
Source: www.bp.com

FIGURE 4.5 Crude-oil consumption per capita (tonnes) people (or 37.7% of the world's population today), move gradually towards greater industrialization, modernization and urbanization, the increasing consumption of crude and other hydrocarbon derivatives will inevitably lead to increased global competition over existing and proven crude reserves. According to Platts Oilgram News, China imported 2.92 million barrels per day of crude oil in the first nine months of 2006, a 16.3% increase from the same period the previous year.[12] This rate of consumption is driven by the growth in the Chinese economy, which expanded by 10.7% in the first three quarters of 2006 and is expected to continue growing at 10.6% for the full year.[13]

- **Crude-oil supply**

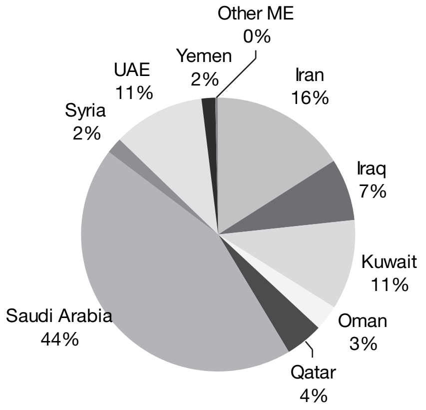
Today, approximately 61.9% of the world's crude-oil reserves, or 742.7 billion barrels, are in the Middle East (see Figure 4.6). In addition to being home to the world's largest hydrocarbon reserves, the Middle East currently has the largest production capacity, led by Saudi Arabia's 11 million barrels per day of production (see Figure 4.7).[14]

The crude-oil reserves of both Iraq, with 115 billion in proven reserves, and Kuwait, with 101.1 billion, are estimated to last more than 100 years.[15] Saudi Arabia, the largest producer within GCC, has reserves for 65 years and the UAE for 97.8 years (see Figure 4.8).[16]



Source: BP Statistical Review of World Energy, June 2006

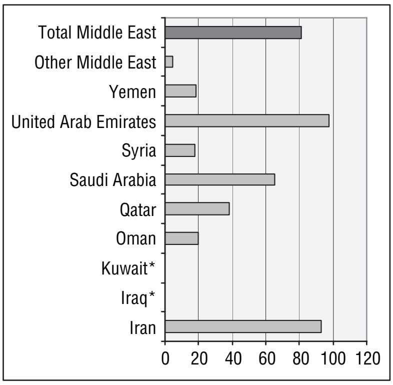
FIGURE 4.6 Proven global crude-oil reserves, 2005 end



- 25.1 million barrels per day of crude oil is produced in the Middle East
- This represents 31% of the world's crude-oil production
- Saudi Arabia is by far the largest producer, with 44% of the region's crude-oil production

Source: BP

FIGURE 4.7 Middle East crude-oil production (2005)



Source: BP

- All reserve-to-production ratios calculated at 2005 production levels
- *Kuwait and Iraq have a reserve life expectancy greater than 100 years
- Saudi Arabia, the region's largest producer, has an expected reserve life of 65.6 years
- UAE and Iran are close to 100 years, at 97.4 and 93 years, respectively

FIGURE 4.8 Reserve life expectancy (reserves/production)

• Crude-oil interdependence

Before analyzing the pricing dynamics in the Middle East, it is important to understand the interdependence between Asia and the Middle East. Most of the incremental crude-oil demand in Asia will continue to be addressed by supplies from the oil-rich Middle East. Of Middle East crude-oil reserves, approximately 66% is exported to the Asian economies. Producers including the Kingdom of Saudi Arabia, Iran, Iraq, Kuwait, the United Arab Emirates, Oman and Qatar currently supply over 70% of Asia's crude-oil import requirements.[17]

Based on the reserve profile of these countries, it is unlikely that Asia's dependence on these sources will decrease. On the buyer side, the top five importers of Middle East crude are Japan, China, South Korea, India and Taiwan (see Figure 4.9). While Japan is the largest importer, importing a staggering 4.2 million barrels per day (89% of its total imports), China and India are poised to increase their dependence at rapid rates, in part driven by high GDP growth.

Commenting on the growing interdependence between China and the Middle East, Messrs Leverett and Bader of the Brookings Institution stated in a report on China–U.S. competition in the Middle East:

> There is every reason to anticipate that China will continue and even intensify its emphasis on the Middle East as part of its energy security strategy. China will likely keep working to expand its ties to the region's energy exporters over the next several years to ensure that it is not disadvantaged relative to other foreign customers and to maximize its access to hydrocarbon resources under any foreseeable circumstances, including possible military conflict with the United States.[19]

As the combined population of China and India increases from 2.38 billion to over three billion by 2050,[20] accompanied by strong GDP growth, it is unlikely that the trends of increasing interdependence will reverse any time soon. Furthermore, as the emerging Asian markets continue to develop, millions of consumers want to know how their crude oil is going to be priced, in order to budget associated revenues and expenses, plan for the development of their economies and protect

	bls/day imported (in millions)	% of imports from ME
Japan	4.2	89%
China	2.4	46%
S. Korea	2.3	78%
India	2	70%
Taiwan	1	84%
Total	**11.9**	

Source: DME presentation on 11 April 2006. FACTS research.[18]

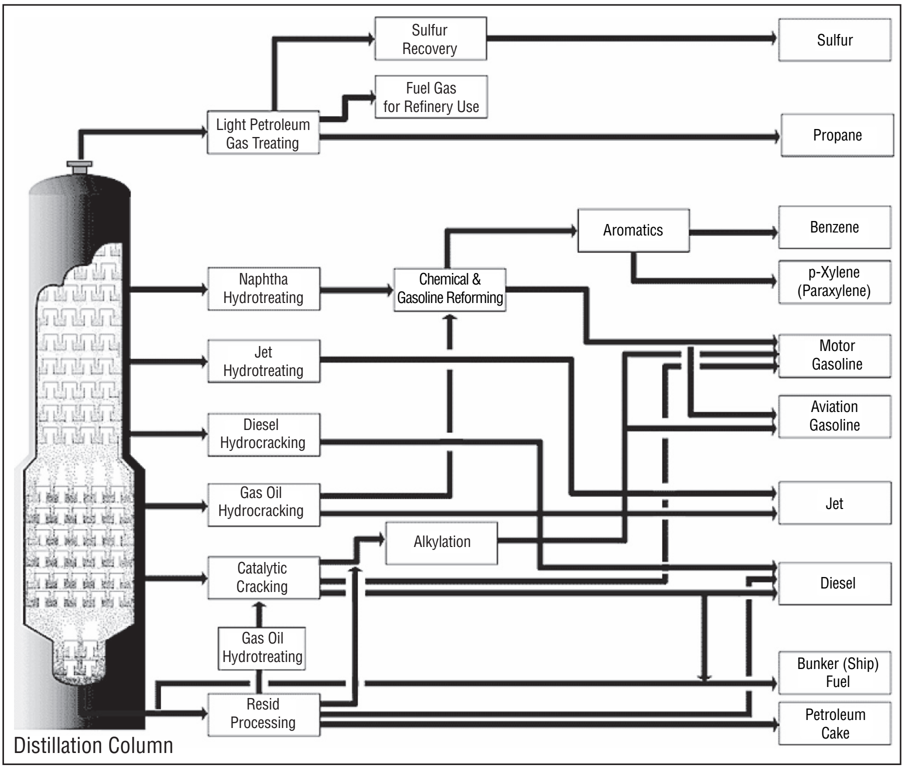
FIGURE 4.9 Top importers of ME crude against volatile price swings. Similarly, producers of sour crude are demanding more clarity, transparency and accuracy in the way sour crude oil is priced. The common objective, it seems, is to have a pricing mechanism specifically for the East of Suez market which best reflects the supply-and-demand fundamentals of the sour crude-oil market.

THE VALUE OF CRUDE OIL

Before entering into the detail of crude-oil pricing, it is important to understand the nature of crude oil and how it is valued. Crude has no value in its natural form. So from where does it derive its value?

- **Crude-oil quality**

First, and most importantly, it should be noted that the value of crude is effectively derived from the value of the products it helps create. In

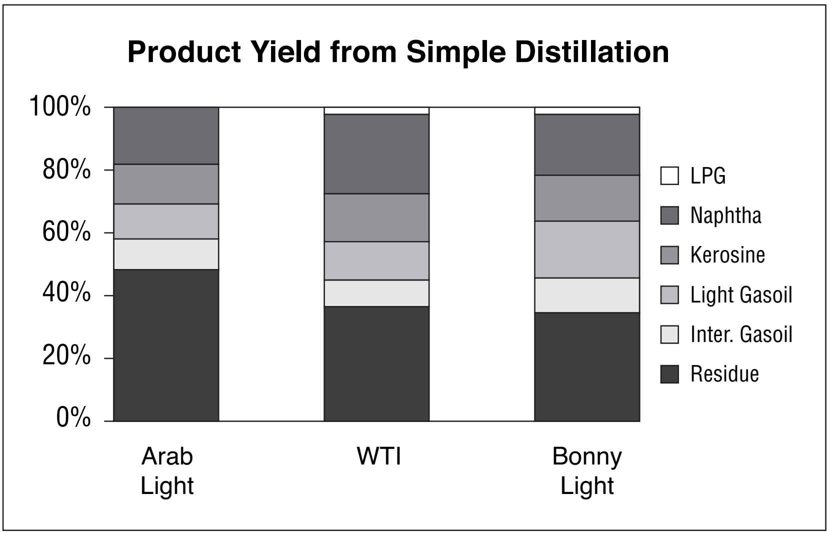


Source: www.chevron.com

FIGURE 4.10 Refining and cracking crude into valuable products order to produce usable products, crude oil, a raw material, is **refined** and **cracked**, the process which refers to the breaking down of the heavier part of the barrel of crude oil into a number of end-products (see Figure 4.10). These end-products, which include jet oil, gasoil, naphtha and diesel, can then be sold in their respective markets at a price representative of their individual supply-and-demand curves.

The quality of the crude determines the quality of the end-products it helps create and the resources required (cost of refining) to help create them. For example, less-dense (or "lighter") crude oils generally have a higher share of light hydrocarbons — higher-value products that can be recovered with simple distillation. The denser (or "heavier") crude oils produce a greater share of lower-valued products with simple distillation, and require additional processing to produce the desired range of products. Some crude oils also have a higher sulfur content, an undesirable characteristic with respect to both processing and product quality.[21]

A brief comparison by the EIA of three crude-oil streams illustrates the point. A premium crude oil such as West Texas Intermediate, the U.S. benchmark, has a relatively high natural yield of desirable naphtha and straight-run gasoline (see Figure 4.11). Another premium crude oil, Nigeria's Bonny Light, has a high natural yield of middle distillates. By contrast, almost half of the simple distillation yield from Saudi Arabia's



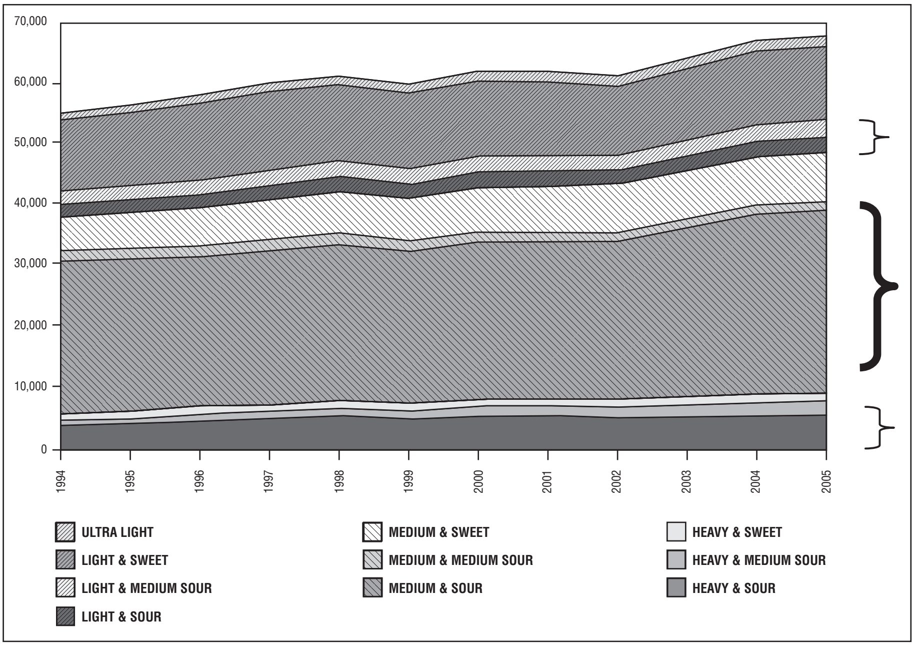
Source: EIA

FIGURE 4.11 Typical product yield from simple distillation

Arabian Light is a heavy residue ("residuum") that must be reprocessed or sold at a discount to crude oil.[22]

There is an increasing disparity between the demand for products and the supply of crude oil. This is due to a relative decrease in sweet crude-oil reserves and an increase in demand for light products, as outlined by Platts:

> Whereas supply has typically become poorer in quality, with more heavy and sour crude in the mix, demand for products has veered the other way; demand for light products has grown most rapidly, whereas demand for residual fuels from utilities has declined mainly because of substitution by gas. Meanwhile, the quality requirements for light products have become evermore strict. Sulfur levels in transportation fuels have tightened relentlessly, a trend which has accelerated since 2000 when leaded fuel was outlawed within the EU. In gasoline and diesel, the sulfur limits are now below 50 ppm (parts per million) in Europe and the US, and similarly tight rules apply in many of the industrialized Asian countries.[23]



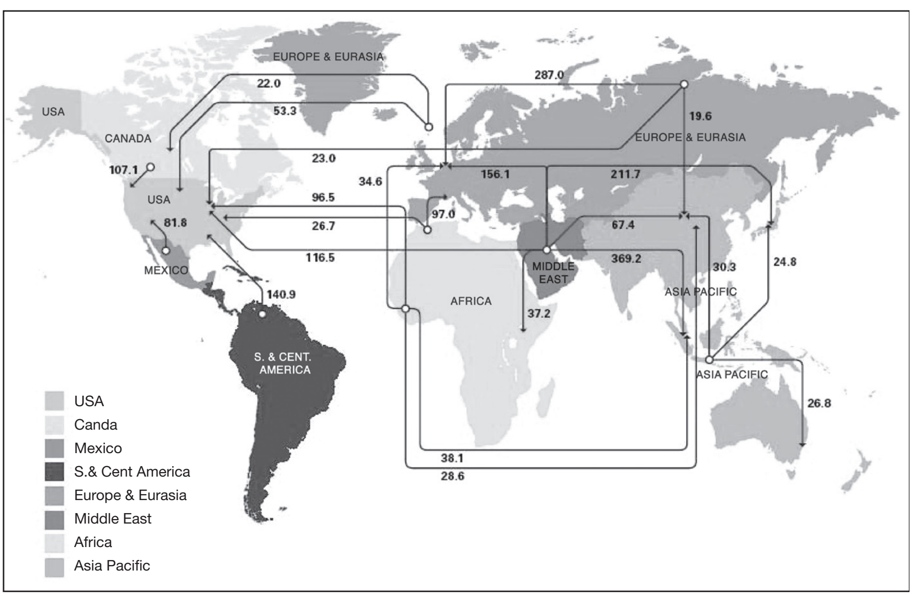
Source: World Oil & Gas Review, ENI 2006

FIGURE 4.12 World crude-oil production by quality (thousand bpd)

As most environmentally conscious countries continue to tighten their emissions standards, the demand for light products will continue to grow. However, the increasing production of sour crude-oil supply means that in order for the pricing benchmarks to be representative of the market, there will need to be an increase in the representation of sour crude-oil prices in order to manage the price volatility that results from the supply-and-demand dynamics discussed above (see section on price volatility below). Figure 4.12 demonstrates the steady global increase in sour crude-oil supplies, specifically in the "medium sour" segment of the quality spectrum.

FREIGHT RATES

The second major determinant of the price of crude oil is the cost of freight associated with transporting crude oil from the source of production to the point of consumption. Crude oil flows both east and west and is based on constantly fluctuating regional supply-and-demand swings (see Figure 4.13). When crude-oil sales include delivery locations other than those specified in the benchmark crude-oil futures contract, a freight differential is applied to reflect the difference. Crude-oil sales to Asia from the Middle East are either done on a CIF (cost, insurance, freight) or an FOB (Free on Board) basis. CIF is a trade term



Source: BP.com

FIGURE 4.13 Interconnected: crude-oil trade flow worldwide (million tonnes) which requires the seller to arrange for the carriage of goods by sea to a designated port of destination, and provide the buyer with the documents necessary to obtain the goods from the carrier. In an FOB sale, on the other hand, the seller sells the goods "over the ship's rail" onto the ship which is arranged and paid for by the buyer. Freight rates are also divided into "dry bulk" and "tanker" rates (for example, for crude-oil tankers) and are influenced by the supply, demand and flow of commodities being transported. Similar to crude oil, freight rates are also characterized by high volatility, and the ability to manage and price them accurately has been critical to successful crude-oil trading strategies and price-risk management. As a result, the freight-rate forward curves have been developed and are actively being used to hedge price movements in a freight market estimated at approximately US$80 billion or four billion metric tonnes per year.[24]

Tanker ocean-freight futures contracts started trading in 2001 on the International Maritime Exchange (Imarex), an Oslo-based exchange for trading of maritime-related derivative contracts. Volumes traded on the Imarex took off in 2004 after the exchange went to screen-based electronic trading. In 2005, the total market for freight derivatives had a value of around US$18 billion, of which dry-bulk (freight associated with transporting dry commodities such as grains) derivatives account for about US$10 billion and tankers account for about US$8 billion.[25]

One definition of freight derivatives provides additional background information on freight futures and their usage:

> A freight derivative is a financial instrument for trading in future levels of freight rate carrying commodities at seas, for dry bulk carriers and tankers. These instruments are [financially] settled against various freight rate indices published by the Baltic Exchange and Platts. Freight Forward contracts are usually traded over the counter, but screen-based trading is becoming more popular as time passes by. Trades can be given up for clearing by the broker to one of the clearinghouses that support such trades. There are four clearinghouses on freight: NOS (Norwegian Clearing House), LCH. Clearnet, NYMEX Clearport, SGX (Singapore). Freight derivatives are primarily used by ship owners and operators, oil companies, trading companies and grain houses as tools for managing freight rate risk.[26]

Together, quality and freight differentials determine the value of crude oil. However, the mechanism through which this price discovery takes places is constantly being reinvented, spurred by advancements in global communications, trading technology and cross-border clearing and settlement systems. The ultimate aim is to better reflect market supply and demand on a real-time basis, 24 hours a day, seven days a week.

PRICE DISCOVERY AND CRUDE BENCHMARKS IN THE WORLD TODAY

We have examined the need for balancing the interests of producers and consumers through the establishment of a "fair price" that represents the Middle East sour crude-oil supply-and-demand fundamentals. This section will analyze the existing price-discovery mechanism for both sweet and sour crude oil, highlighting the need for change in Middle East sour crude-oil pricing.

Before assessing the various price-discovery mechanisms, let's take a quick glance at what makes a successful crude-oil benchmark. A crude-oil benchmark is a price-reference marker designed to reflect supply-and-demand conditions in the crude-oil market and assist in the price-discovery process. It ultimately establishes a common standard against which relative grades of crude oil can be commonly priced. Hence, it is important that the benchmark accurately captures the physical market's assessment of the supply-and-demand curves associated with the underlying crude oil being referenced. Finally, a benchmark is reported on extensively by price-reporting agencies and futures exchanges, and is essential in the pricing of oil and gas transactions.

In a purely economic sense, the marginal barrel of the benchmark crude oil traded on the spot or physical market determines the price of that crude.[27] The **spot** or **cash** or **physical** market is one in which a buyer or seller can transact freely today. The concept of the marginal barrel is based in the marginal-cost concept of economic theory which states:

> A (rational) producer should always produce (and sell) the last unit if the marginal cost is less than the market price. As the market price will be dictated by supply and demand, it leads to the conclusion that marginal cost equals marginal revenue, or the extra revenue that an additional unit of product will bring a firm.[28]

It is important to note that the majority of Middle East crude oil is sold to Asia on a term-contract basis, usually defined as a one-year contract, rather than in the spot market. This helps mitigate the security-of-supply issues of major Asian refineries, which are increasingly dependent on Middle East crude oil. Platts, one of the major energy price-reporting agencies, comments on the role of spot markets in pricing:

> Since the marker [benchmark] crude system was introduced in the mid-1980s, there has been general industry acceptance that spot trade in these barrels acts as a barometer of the overall market level. Different grades of oil are priced on negotiable differentials to the marker grade. The rationale is that, in any market, the spot price represents the balancing point of supply and demand. Even though the volumes of oil that trade daily on a term contract basis between companies or governments are much bigger than those that trade on a spot basis, price is determined at the margin, that is, in the spot market.[29]

There are some key characteristics which help define successful crude-oil benchmarks and are important for assisting in the development of a price-discovery process that is robust and free of manipulation; enabling market supply-and-demand factors to be reflected "fairly" in the price of the benchmark or reference crude-oil marker. These characteristics include, but are not limited to, the following:

- **Physical volume, diversified ownership and the availability of spot crude**

Sufficient physical production and availability of the underlying crude is necessary to avoid potential manipulation in the crude-oil market. For example, upward market squeezes occur when one particular player in the market is able to buy up the majority of the underlying commodity and force the price up by withholding that physical volume from the market. Diversified ownership of storage and physical infrastructure as well as the availability of spot barrels, which are purchased in the cash market, help facilitate a robust price-discovery mechanism. According to Platts, production of close to 500,000 bpd is a critical requirement for being a strong benchmark.[30]

- **Many buyers and sellers**

An efficient market is one in which there are many buyers and sellers who participate in the price formation through an equitable and transparent process. No single market participant should be able to exert undue influence over the price of crude oil. The greater the number of participants who trade the underlying physical crude oil, the greater the chances of building liquidity in a benchmark crude and thus the lower the likelihood of price manipulation.

- **Freely traded, destination-free**

In order to support a highly liquid and easily traded futures contract, it is imperative that the eventual holder of the futures contract at maturity has unencumbered access to the underlying commodity. Oman and Dubai crude-oil streams are the two freely traded or non-destination-restricted crude oils in the Arabian Gulf. Other major producers, such as Saudi Arabia, Abu Dhabi and Kuwait, have destination restrictions tied to their crude sales, which prohibit re-trading of the crude and result in direct sales to the refineries.

- **Representative and fungible**

Successful benchmark crude must be representative of the crude oil in the market, with respect to the quality (API and sulfur) that it is trying to benchmark. A Middle East sour crude-oil benchmark will remove the basis risk that currently exists as a result of using sweet crude-oil benchmarks (WTI or Brent) to price or hedge sour crude-oil price exposure. The benchmark crude must also be fungible. This implies that the benchmark crude can be substituted for another.

- **Producer support and physical backing**

The option to take physical delivery in a crude-oil futures contract, such as the WTI contract traded on NYMEX, creates a direct link with the underlying physical crude. This helps prevent disconnects in value between the futures market price and the underlying physical spot price, and builds market confidence in the price-discovery process. However, this is not an absolute requirement as Brent crude, whose futures are financially settled, is a highly liquid and successful benchmark for global crude-oil transactions today, despite occasional disconnects in the past between the physical spot price (known as Dated Brent) and the futures price (Brent or BFO). For the successful development of a physically backed crude-oil futures benchmark in the Middle East, it is imperative to have the support of the sour crude-oil producers in the region; specifically, from the producer of the underlying benchmark crude oil.

Today, there are currently two established sweet crude-oil benchmarks that trade on futures exchanges: West Texas Intermediate

(WTI), which has primarily traded on the New York Mercantile Exchange since 1979; and Brent (known formally as BFO — Brent, Forties, Oseberg) which has traded primarily on the Intercontinental Exchange (ICE) since 1988. Both exchanges now trade each other's contracts via what is known as "look-alike" contracts. However, for the purpose of our analysis, we will refer to WTI as the NYMEX contract and Brent as the ICE contract. WTI is widely used in the pricing of U.S. domestic crude oils, as well as oil imports into the U.S. Brent is often regarded as the international oil benchmark, pricing over two-thirds of the world's crude-oil transactions. According to Platts:

> Brent has become the de facto international oil benchmark partly because of its location and partly because it is a good quality oil that can be used by a wide range of refineries. The physical value of North Sea Brent ("dated Brent") is widely used in benchmarking the bulk of oil from the North Sea, West and North Africa, Russia and Central Asia, as well as large volumes from the Middle East heading into western markets.[31]

The third crude-oil benchmark, Dubai, has long been the benchmark for a large proportion of the world's sour crude oil. The majority of Middle East sour crude oil sold into Asian markets, more than 12 million barrels per day, is priced based on the Dubai marker, which trades over the counter in the Singapore market. Dubai crude oil was initially chosen by the market as the benchmark crude as it was freely traded and supported by the Government of Dubai as a non-destination-restricted crude. In the 1980s, when it became the benchmark, trading of Dubai was liquid and production exceeded 30 cargoes or 500,000 barrels per day.[32] According to a Platts report:

> Insiders involved in setting up the Saudi marker crude pricing system during this period have emphasized that the main criteria in the selection of which crude oils to use (for example, Dubai, Brent) were the liquidity of the market, and the observability of price change, known as the transparency of the market.[33]

In May 2007, ICE launched a Dubai crude-oil futures contract that is cash-settled against a Platts assessment of the physical value of Dubai crude cargoes trading in the OTC markets. However, with less than 100,000 barrels per day of production in the underlying Dubai crude, it is unlikely that the ICE Dubai futures contract will sustain liquidity into the future or replace WTI as the world's crude-oil benchmark.

Despite differences in the three crude-oil benchmarks, the crude-oil market is interconnected and accepted as one single market in which individual, regional crude-oil streams are priced in relation to one another at freight and quality differentials, also known as "spreads". Today, the anchor for global crude-oil pricing rests in the NYMEX as it is the most liquid of all price-discovery mechanisms and provides the greatest confidence to those in search of a fair and transparent price. Spread trading between the three benchmarks, WTI-Brent and Brent-Dubai, is a common technique used by traders in managing price risk and ensuring that the quality and freight differentials accurately reflect the market's perception of the relative value of each crude oil. However, as we will see later, the highly liquid, futures-based pricing mechanism for sweet crude oil is not representative of the bulk of world crude, Middle East sour crude oil. Based on current and ongoing initiatives in the Middle East, it is likely that a new global benchmark will emerge in the 21st century.

COMPARING WTI, BRENT AND DUBAI

There are notable differences between the WTI, Brent and Dubai crude-oil price benchmarks. These differences are highlighted below to emphasize the urgent need for a highly liquid, transparent Middle East sour crude-oil benchmark that is physically deliverable and on par with the sweet crude-oil benchmarks, to relieve Dubai of its uphill battle as the crude-oil benchmark for the world's largest hydrocarbon province. The following analysis will compare and contrast these benchmarks according to:

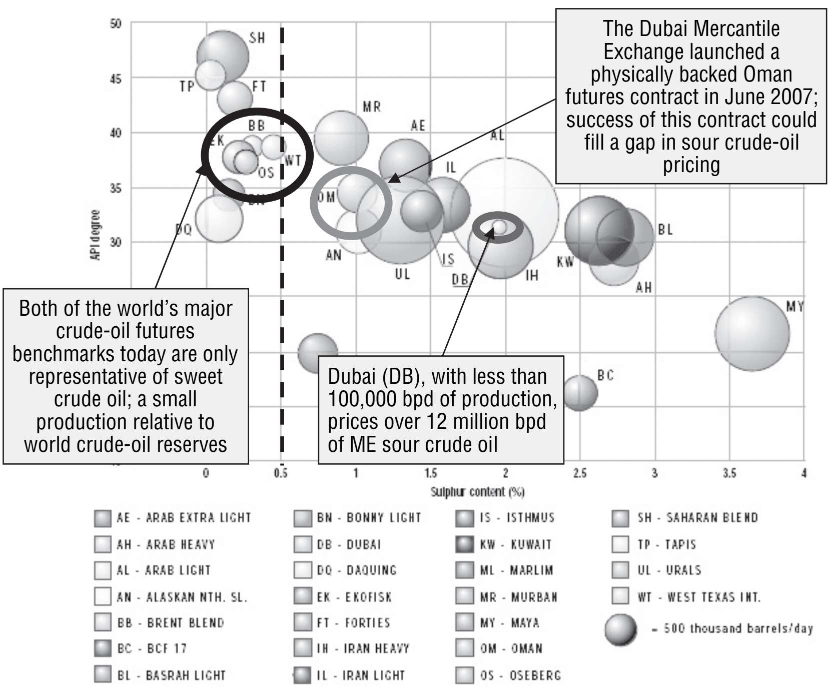
- Representation of the physical market
- Liquidity and underlying production
- Price-discovery mechanisms: OTC vs. futures markets
- Representation of the physical market: sweet vs. sour

It is important to understand the difference between sweet crude oil and sour crude oil. Various grades of crude oil around the world are classified by two primary measures:

1) Sulfur: the sulfur content in the crude, and
2) API Gravity: a standard for measuring the relative density or gravity of petroleum liquids, developed by the American Petroleum Institute.[34]

Sour crude derives its name from the increase in sulfur content (greater than 0.5% sulfur). Crude oil is also classified as light, medium or heavy, according to its measured API gravity. Light crude oil is defined as having an API gravity higher than 31.1° API; medium oil is defined as having an API gravity between 22.3° API and 31.1° API; and heavy oil is defined as having an API gravity below 22.3° API.[35]

The majority of the world's crude oil is classified as sour crude. The size of the circles in the chart below represents the relative size of the various crude-oil streams from around the world. Today there are two main international crude-oil futures benchmarks, WTI and Brent (BFO), both of which are only representative of sweet crude oil (see black circle in Figure 4.14). As a result, the majority of the world's crude oil is under-represented in the world of crude-oil pricing.[36]



Source: World Oil & Gas Review, ENI 2006

FIGURE 4.14 Global crude-oil quantity and quality comparison (size of bubble reflects the size of underlying reserves)

Commenting on the regional dynamics of crude-oil pricing and the current shortcomings of the pricing environment, Robert Mabro of the Oxford Institute for Energy Studies states:

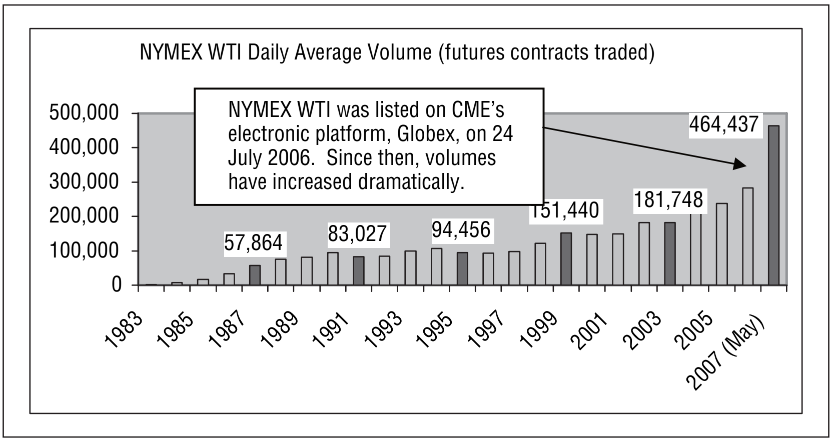
> The idea of trailing the market has a strong economic rationale if the market that is being followed is the locus where demand and supply forces meet on a world scene. In such a case the price that emerges brings into balance world supply and demand. The markets which generate the reference on marker prices which exporting countries use for selling their oil — being Brent, WTI or Dubai — have important limitations. *The first is that they are regional markets. The WTI price is strongly influenced by the balance between oil demand in the Chicago region and crude supplies in the US Gulf region. The Brent price is similarly influenced by demand and supply conditions in NW Europe. Although there is arbitrage between different regions of the Atlantic Basin, this force operates much more weakly as we move further away from that basin.*[37] [italics added]

There is a clear need for a sour crude-oil benchmark that is representative of the majority of the world's crude oil, Middle East crude, and its supply-and-demand factors. Brent and WTI do not currently serve this function and Dubai crude, with less than 100,000 barrels of production per day (see Figure 4.14), is too small in volume to accurately represent the vast Middle East crude market.

- **Liquidity and underlying production**

West Texas Intermediate (WTI)

In the U.S., the price reference for light, sweet crude oil is set through the WTI futures contract on the New York Mercantile Exchange. The WTI crude stream can be made up of production from Texas, New Mexico, Oklahoma and Kansas. The common thread is the NYMEX Division light, sweet crude-oil futures contract whose specifications limit sulfur to 0.42% or less by weight and API gravity to a range of 37–42°.[38] Actual production volumes of WTI are hard to determine because of blending and pipeline commingling of domestic streams, but it is generally estimated to be no more than 350,000 bpd, down from 750,000 several years ago.[39] Despite the relatively small production stream of WTI crude, NYMEX traded a record daily average futures volume of 464,437 contracts in May 2007 (see Figure 4.15).[40] Each WTI contract on NYMEX has a size of 1,000 barrels, implying that a



Source: NYMEX WTI data

FIGURE 4.15 Growth in WTI volume

notional 464.4 million barrels of light sweet crude on average trade daily on the NYMEX. Hence, WTI futures contracts traded daily reflect a multiple of over 1,000 times the physical underlying crude. This high level of liquidity has created credibility in the price-discovery process for WTI crude and solidified NYMEX's position as the largest physical energy-futures exchange in the world. It is also important to note that this high volume of crude-oil futures against the underlying physical crude has provoked a debate about the role of futures on rising oil prices. The Organization of Petroleum Exporting Countries (OPEC) recently produced a report on "The Impact of Financial Markets on the Price of Oil and Volatility". This analysis, which is not within the scope of this chapter, can be obtained from the OPEC Secretariat's Research Division.[41]

Unlike some financially-settled futures contracts, which can be settled for the cash equivalent of the number of barrels being traded, WTI futures are physically deliverable by pipeline at Cushing, Oklahoma. Hence, if the buyer of a WTI crude-oil futures contract at NYMEX decides to hold the contract until maturity, he or she has legal title to the physical underlying asset. In summary, the strong liquidity in the NYMEX WTI futures contract makes it a reference marker for U.S. light sweet crude oil as well as for international crude-oil shipments to the U.S. For example, Saudi Arabia's crude-oil exports sold into the U.S. market are priced at a differential to WTI futures. The differential, as explained in the previous section, usually includes a quality and freight component.

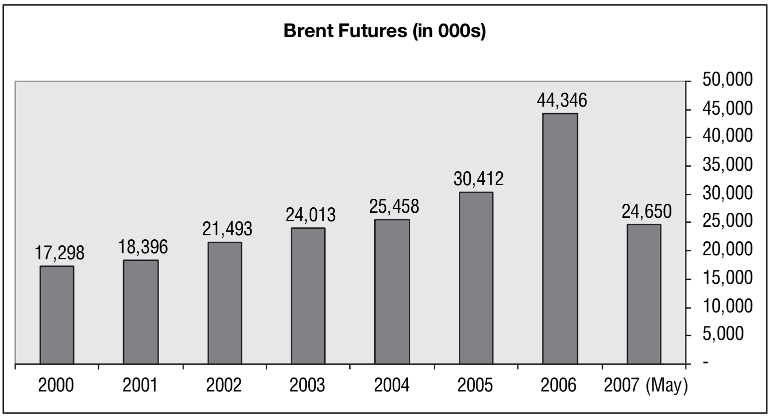
Brent

The crude-oil benchmark for Europe is Brent crude oil, which trades actively in the Intercontinental Exchange (ICE). The Brent futures contract, with a size of 1,000 barrels per contract, reached a record volume of 387,422 on ICE on 15 May 2007, implying a trading volume of over 387.4 million barrels-worth of crude oil (see Figure 4.16). However, unlike the WTI contract, the Brent futures contract is not physically deliverable; it is financially settled at expiry.[42] This detachment from the physical or Dated Brent market has the potential to create price disruptions in the futures markets, especially as production and the number of available cargoes declines.

Highlighting the key issues surrounding price squeezes in the crude-oil markets, Platts states:

> A key problem today is the declining production of benchmark crude oils. As the number of cargoes available to the market each month becomes less, it leaves the benchmark vulnerable to potential price distortion. If fewer cargoes are produced, and some that are produced are allocated in term contracts, the volume of oil available for spot trading may fall below a critical threshold. In such circumstances, it may become possible for companies to buy or control all the available cargoes and squeeze the market. Given the huge volumes of oil tied to the benchmark, the leverage exerted on prices can be huge.[43]

For Dated Brent, physical production declined to 20 cargoes in mid 2002, from over 50 cargoes per month in previous years. This decline precipitated the need for additional liquidity, and price-reporting agencies responded quickly by including similar crude-oil streams from the North Sea, namely Forties and Oseberg, in the price-discovery process. According to Platts, "the new methodology dramatically increased the pool of physical supply being traded on a spot basis, thereby reducing any one player's ability to squeeze the market".[44] Today, the BFO stream produces approximately 1.1 million bpd of crude, helping support Brent as a major global benchmark.



Source: ICE[45]

FIGURE 4.16 Growth in Brent crude-oil futures

Dubai

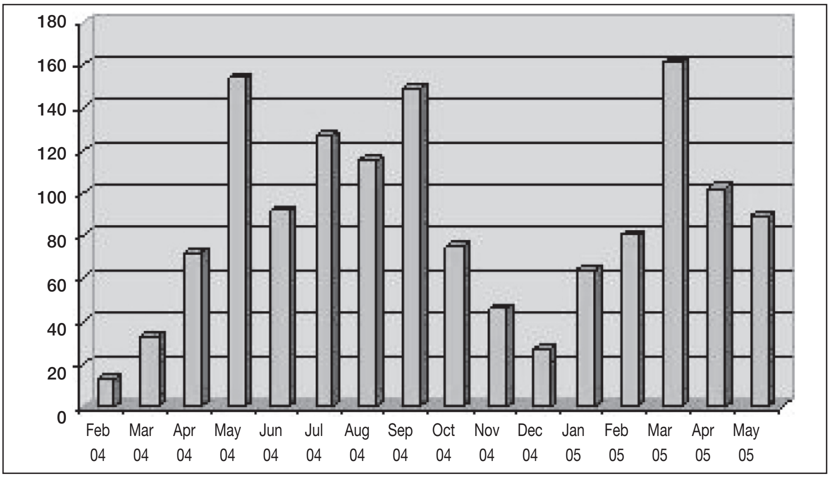
Dubai crude production volumes have also been declining and, according to industry sources, currently stand at less than 100,000 barrels per day. Dubai crude was originally a liquid benchmark, with over 400,000 bpd of production in the early 1990s. Adrian Binks, a Managing Director at Argus Media Group, had this to say on the significance of the Dubai crude oil benchmark:

> It is hard to overstate the importance of the Dubai benchmark. It is one of the base prices in most of the crude price formulas for Middle Eastern crude sold in the Asia-Pacific market. It is used by Saudi Arabia, Iran, Iraq and Kuwait in their term contracts, and is also a price indicator used to help set official prices of Abu Dhabi and Oman crude. These grades then trade at a differential to the Dubai-influenced official price.[46]

However, with the decline in production volume to a few cargoes per month, liquidity concerns have resulted in significant steps being taken by price-reporting agencies such as Argus and Platts. For example, in November 2001, with an aim to boost liquidity, Platts made Oman deliverable into the Dubai contract. Dubai production had fallen to 11 cargoes per month and was expected to decline further.[47] By enabling Oman crude oil to be delivered into the Dubai contract, Platts hoped to prevent buyers from hoarding the few Dubai cargoes and causing upward market squeezes similar to those experienced in the Brent market. The move, according to industry analysts, was a short-term solution to the long-term challenge of sustainable liquidity.

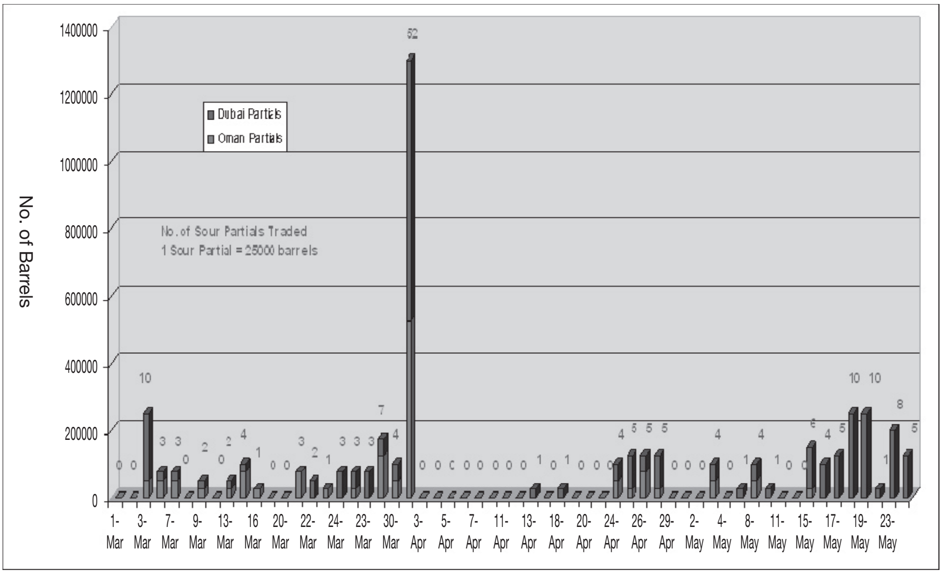
Then, in March 2004, prompted by ongoing liquidity and transparency concerns Platts introduced Dubai and Oman "partials" to help compensate for the shortfalls of price-discovery in the OTC market. Partials are 25,000-barrel contracts, considerably smaller than the full 475–500,000-barrel cargoes traded in the physical market. Created primarily for price-discovery purposes, partials trading rarely results in physical delivery as 19 partials are required to create a minimum physical shipment of 475,000 barrels. Furthermore, Platts allowed market participants to post partials trades transparently on a screen-based trading window, referred to as the "Platts window" or "partials window", from 16:00 to 16:30, Singapore time.

The primary objective behind the creation of partials was to increase the number of market participants trading Middle East sour crude oil. It appeared to work, as liquidity initially increased, with approximately 22 firms participating in the partials market. During the summer of 2004, monthly trading in Dubai-Oman partials averaged 100–125, equivalent to 2.5–3.1 million barrels of underlying sour crude (see Figure 4.17).[48] However, despite the initial success of the partials, trading still reflected a fraction of the hundreds of millions of barrels of Middle East crude-oil production sold to Asia on a monthly basis.



Source: Platts Baltic Methodology Forum, July 2005

FIGURE 4.17 Dubai-Oman Partials February 2004–May 2005



Source: DME presentation, Bangkok, August 2006. Data from Platts Crude Oil Marketwire.

FIGURE 4.18 Reported sour partials daily volume (1 March–24 May 2006)

Unable to sustain the liquidity needed for effective price discovery in Dubai-Oman sour crude oil, trading in the Platts partials window began to decline. By November 2004, eight months after launch, just 14 Dubai partials traded during the entire month, the equivalent of less than a single cargo of Dubai crude.[49] In a presentation to the industry in mid-2006, Gary King, CEO of the Dubai Mercantile Exchange, demonstrated trading in the Platts window to be even thinner, averaging only around four to five partials daily. On more than one occasion, no partials were traded, indicating a major weakness in the OTC price mechanism for Middle East sour crude oil (see Figure 4.18).

PRICE DISCOVERY: OTC VS. FUTURES MARKETS

The previous section examined the difference in liquidity between the price-discovery mechanisms for Western sweet crude oils with that of sour crude-oil trading in the East of Suez market. This section will help explain why sweet crude-oil futures markets are more robust pricing mechanisms than sour crude-oil OTC markets. We will focus specifically on the areas of regulatory oversight, credit mitigation and transparency that are offered by futures markets.

- **Regulation**

Both NYMEX and ICE are price-discovery centers which are heavily regulated by bodies such as the Commodity Futures Exchange Commission (CFTC) in the U.S. and the Financial Services Authority (FSA) in the U.K., respectively. This regulatory oversight is critical in ensuring efficient price discovery. According to the CFTC website:

> …the CFTC assures the economic utility of the futures markets by encouraging their competitiveness and efficiency, ensuring their integrity, protecting market participants against manipulation, abusive trading practices, and fraud, and ensuring the financial integrity of the clearing process. Through effective oversight, the CFTC enables the futures markets to serve the important function of providing a means for price discovery and offsetting price risk.[50]

Some of the tools employed to enhance price discovery in a regulated, manipulation-free futures environment include, but are not limited to:

Market surveillance

Large trade data reports monitor market participants and their outstanding trading positions in the market (for example open interest). This helps ascertain whether specific market participants are trading with the intention to manipulate or influnce prices irregularly and helps pre-empt market squeezes.

Exchange authorizations and membership requirements

Strict membership rules ensure that trading firms have adequate infrastructure to manage their trading activities. This includes requirements for establishing compliance and risk-management processes, and minimum capital requirements.

Legal recourse

Regulatory bodies have the legal powers to investigate and prosecute violations of industry rules and regulations through relevant courts.

In contrast, the OTC market is an unregulated market, with limited visibility into the trading activities of its participants. It is the responsibility of transacting parties to conduct due diligence on trading partners, whose risk they will assume bilaterally, and to ensure that adequate credit-mitigation processes are in place to prevent potential fraud or credit-related defaults. Often, the process of securing adequate credit protection with another party can take up to several months, thereby limiting the number of participants in the crude-oil OTC market.

- **Transparency**

Futures markets for sweet crude oil are also transparent trading environments in which each trade is publicly visible in real time almost 24 hours per day. In the futures markets, the buyer and seller remain anonymous, thereby reducing market movements associated with the identity of transacting parties. Furthermore, futures markets enable traders to transact forward, many months and even years in the future. At NYMEX, WTI crude-oil futures trade as far forward as five and seven years. This transparency enables market participants to hedge their price-risk exposure out into the future and provides the market with better information regarding the supply-and-demand fundamentals.

In contrast, price discovery in the OTC markets for Middle East sour is limited to the thinly traded Platts partials window, in which there is limited market participation for a 30-minute period. In the absence of liquidity in the Platts window, additional price assessment in the OTC market is conducted by the collection of trade data by voice brokers, who contact major traders of Dubai and Oman crude oil for price indications. In addition, there is limited anonymity in the OTC markets as only brokers are aware of the identity of transacting parties. The lack of transparency in the OTC market prohibits the development of a forward curve for sour crude oil beyond the three months that are quoted by Platts. Finally, as Platts indicates in its pricing methodology, despite its efforts to maintain integrity and fairness in its price reporting, there is no guarantee that the prices captured or assessed are 100% reflective of trading activity in the sour crude-oil market:

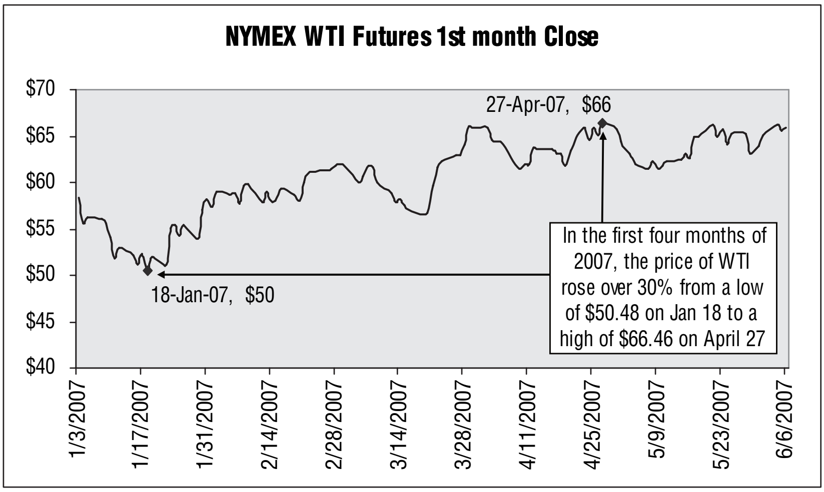
> Platts treats firm trading positions and deals from internet platforms exactly as it does any other information from principals or from intermediaries such as voice brokers. Platts cannot make any guarantee in advance, as to how or whether the information will be incorporated in its final assessments. All trading positions and deals submitted to Platts need to meet general requirements on openness and transparency. Platts market specialists then make an assessment based on published assessment parameters using all the information available.[51]

- **Credit mitigation**

Unlike the OTC market, the energy futures markets offer credit mitigation to buyers and sellers transacting through a commodities exchange. This is enabled through a variety of mechanisms, including:

Clearing house: In the crude-oil futures market, the clearing house is the counterparty for all futures transactions. In the case of WTI futures at NYMEX, all trades are cleared through its AA+-rated clearing house, which comprises pre-approved, regulated financial institutions (Clearing Member firms). In addition to requiring Clearing Members to deposit cash collateral into a central fund, effectively the clearing house, NYMEX has also purchased incremental insurance to safeguard against potential market defaults.

Initial and variation margin requirements: In the regulated futures markets, traders are required to maintain cash-margin requirements to minimize price exposure related to open positions. Positions are constantly marked-to-market to reflect current price movements. The use of initial and variation margining enables Clearing Member firms to ensure that clients with trading positions are able to fulfill commitments on futures purchases or sales.



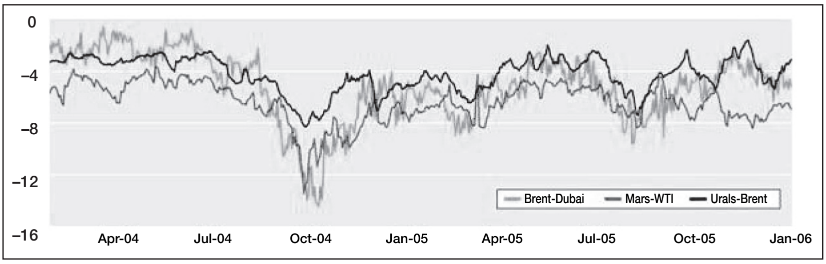
Source: NYMEX

FIGURE 4.19 Rising crude-oil prices increase OTC credit concerns

As both volatility in oil prices and the absolute value of sour crude oil increases, the level of credit risk associated with bilateral OTC trades is also increasing (see Figure 4.19). Consequently, it is becoming increasingly important for participating firms to have cost-effective mechanisms for credit mitigation. The absence of such mechanisms in the OTC market will inevitably create more financial disasters like the China Aviation Oil debacle in 2004, where a rogue trader incurred US$550 million in derivatives losses related to selling OTC crude-oil calls.[52] The clearing house of a futures exchange provides end-users with a credit-mitigation facility so that they can avoid such counterparty credit risks.

A NEW PRICING PARADIGM

Crude-oil markets are interconnected and characterized by price volatility resulting from a number of economic, political, social and environmental factors which affect supply-and-demand dynamics (see Figure 4.20). As a result, it is becoming more important for consumers, traders, refiners and producers of crude oil to have the necessary tools to manage price risk associated with daily price fluctuations. In the liquid sweet crude-oil futures market, participants are able to hedge easily and cost-effectively in a regulated and transparent environment. However, in the OTC markets for sour crude oil, a lack of transparency and credit-mitigation mechanisms greatly reduces market participation and the ease of hedging Middle East sour crude-oil cargoes.

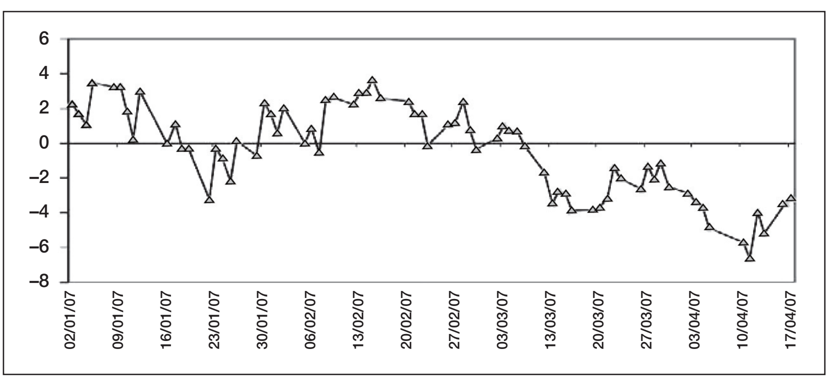


Source: Platts

FIGURE 4.20 Crude price volatility: Sour discounts to sweet crude oil

In the Middle East, sour crude-oil sales to the U.S. and Europe are usually priced off the WTI futures and the Brent futures benchmarks, respectively. A freight and quality differential is applied to account for the difference between the sweet and sour crude oil. As a result of past price squeezes in Brent crude oil, which we discussed earlier, certain Middle East producers such as Saudi Arabia, Kuwait and Iran now price crude-oil sales to Europe off the weighted-average settlement price for Brent futures traded on the International Petroleum Exchange (IPE), commonly known as the B-WAVE. By taking a weighted average, producers can have greater confidence in the price-discovery mechanism and prevent outlying trades from skewing the final settlement price.

The WTI benchmark, often considered the backbone of global energy pricing, is currently undergoing a serious review by the industry. In first half of 2007, WTI prices decoupled from global oil prices as Cushing, Oklahoma (the delivery location for WTI crude oil) suffered an oversupply of crude-oil inventories that arose from a number of factors, including refinery shutdowns, increasing crude flows from Western Canada, and a logistical quagmire as a result of a one-way pipeline system that prevents the redistribution of excess supply towards alternative crude-oil demand centers. Ian Taylor, President of Vitol SA, one of the world's largest independent oil-trading companies, with a turnover in excess of US$114 billion in 2006, had this to say on the benchmark status of WTI crude: "I would agree that WTI is beginning to be seen as a domestic crude and not an international marker." He predicted that London Brent crude could remain at a premium to U.S. crude.[53] The excess supply at Cushing has resulted in the narrowing and, in certain cases, the reversal of sweet–sour differentials and a steeper forward price curve (see Figure 4.21).



Source: EIA

FIGURE 4.21 WTI Spot Minus Brent Spot (Jan – April, 2007)[54]

In his analysis on the future reliability of WTI as the global crude-oil benchmark, Dr. Bassem Fattouh, a Senior Research Fellow at the Oxford Institute for Energy Studies, states:

> WTI's dislocation has had serious implications across the various crude oil markets, resulting in unusual price differentials. These effects, however, do not imply that the local market is not functioning well. On the contrary, price movements are efficiently reflecting the local supply-demand conditions in Cushing. The main problem is that when localized conditions become dominant, WTI can no longer reflect the supply-demand balance in the US, nor act as an international benchmark for pricing the millions of barrels of oil imported into the US. This raises the issue of the suitability of WTI as an international benchmark.[55]

The jury remains out on whether WTI can resume its much-coveted role as the world's crude-oil benchmark. In the meantime, it will be important to watch the behavior of crude-oil producers, consumers and traders as they navigate between WTI and Brent price differentials in an attempt to manage their basis risk.

Unlike the futures-based pricing of the West, Middle East sour crude-oil sales to Asia are priced off the Dubai benchmark, which is established through price assessments in the OTC market. Middle East producers price over 10 million of barrels of their respective crude oils at a differential to the Platts Dubai-Oman price assessment. This assessment acts as the foundation for all price discovery of Middle East sour crude oil to Asia, despite not having the liquidity or transparency of a futures exchange. The example below highlights how a Middle East crude-oil producer, the Sultanate of Oman, sets its Official Settlement Price (OSP) for crude-oil sales to Asia by utilizing the OTC-based Dubai benchmark (see Figure 4.22). It is important to note that unlike WTI crude oil, which is delivered within a week via pipeline at Cushing, Oklahoma, the Middle East or East of Suez market is a tanker market. Hence, the East of Suez crude-oil market is considered to be a two-month market (see Figure 4.23), given the time it takes to schedule a tanker, pick up the crude from the delivery port and then transport it to its final destination (for example, in Asia). Hence, the front month (also known as the "spot" or "prompt" month) for Middle East sour crude-oil trading in June is August.

Oman OSP (December) = (A) Dubai cash price, month February + (B) the X factor	
(A) Dubai (FEB) 59.18-59.20 Dubai (MAR) 59.57-59.59 Dubai (APR) 60.17-60.19	**Dubai is the main benchmark crude for ME sour crude oil** • The Dubai (cash price) is determined via trading in the Platts partials window • Given the ME crude market is a two-month market, the front month is February (circled)
(B1) MOG Swap Diff (DEC) -0.60/-0.56 MOG Swap Diff (JAN) -0.57/-0.53 MOG Swap Diff (FEB) -0.33/-0.26 MOG Swap Diff (MAR) 0.08/ 0.12	**Oman sets the X-factor, retroactively (after the month of delivery), based on a number of price indicators:** B1: MOG/Swap differential is the expected difference between the Dubai and Oman OSP which results from quality differences and various supply-and-demand curves for each crude-oil stream
(B2) Oman (FEB) MOG -0.17/-0.56 Oman (MAR) MOG -0.57/-0.53 Oman (APR) MOG 0.08/ 0.12	• B2: Premium/discount to Oman MOG price: reflects where the market is buying or selling Oman crude cargoes relative to the OSP (supply & demand based) • The physical market uses this indicator for trading purposes to minimize exposure as it is the most risk-free way to trade.

FIGURE 4.22 How Oman MOG prices its crude[56]

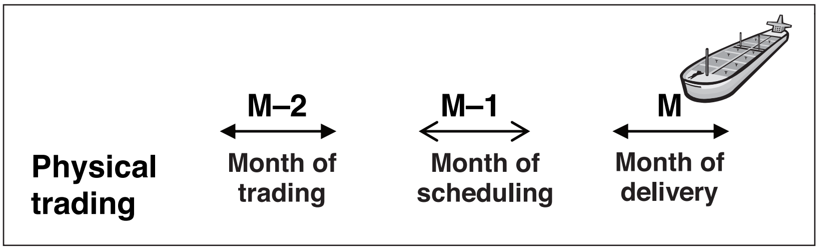


FIGURE 4.23 Tanker-delivery market — East of Suez

As seen in the example shown in Figure 4.22, setting the monthly OSP is not a simple and straightforward process, as the underlying crude oil being priced (Oman) has to rely on an illiquid benchmark which is based on price assessments in an unregulated OTC market. As a result, MOG Oman uses a variety of price indicators, such as the MOG Swap differential (which reflects the difference in value between Oman and Dubai crude streams) and the Oman MOG price (which reflects the market's perception of what the value of Oman crude is relative to the final OSP price that MOG will set retroactively). In addition, MOG, like other producers, will look at market supply-and-demand fundamentals and speak with major market participants (including their customers) to capture the fair market value of Oman crude. Other crude-oil producers in the Middle East also face the same informational challenges with respect to setting their respective OSPs.

What, then, is the solution to the problem plaguing Middle East sour crude-oil pricing? According to Platts, the recent introduction of yet another crude-oil stream, Upper Zakum, might add much needed liquidity to the OTC price assessment which already includes Dubai and Oman crude oil. Other regional developments, such as the Dubai Mercantile Exchange (DME),[57] propose a different solution altogether. With the aim of creating sustainable liquidity and transparency in the price-discovery mechanism for Middle East sour crude oil, the DME launched a physically backed Oman crude-oil futures contract in June 2007. Oman crude oil, formally known as Oman Export Blend Crude, is a medium-sour crude oil that meets many of the key requirements of a benchmark crude. It has a production in excess of 750,000 barrels per day and is a freely traded or non-destination-restricted crude oil. In addition, Oman crude oil is delivered at Mina Al Fahal, a port outside the Straits of Hormuz, a convenient loading destination for cargoes moving both east and west. Finally, given that Oman is currently traded in the OTC markets alongside Dubai crude oil, there are many existing buyers and sellers of Oman crude oil.

In order to make Oman the new sour crude-oil benchmark, DME has to ensure that the futures contract is well regulated, liquid and has the support of both producers and consumers. To this end, the Dubai-based initiative has taken many steps towards securing a successful 2007 launch. First and foremost, the DME is a joint-venture between reputable and credible partners: the Government of Dubai, through Tatweer, a subsidiary of government-backed Dubai Holding; the New York Mercantile Exchange; and the Sultanate of Oman through the government-backed Oman Investment Fund. As part of the joint venture, DME will utilize NYMEX's AA+-rated clearing house in order to provide sour crude-oil traders with a proven mechanism for credit mitigation, similar to that which already exists in sweet crude-oil futures markets. The DME will also, like NYMEX and ICE, be a regulated exchange. It is based in the Dubai International Financial Centre and will be under the regulatory watch of the newly created Dubai Financial Services Authority (DFSA), a regulator modeled after the high standards of the FSA in the U.K..[58] In addition, the Oman crude-oil contract is similar in size (1,000 barrels per contract) and tradability (electronically accessible almost 24 hours per day) to both WTI and Brent futures. This will help facilitate the trading of sweet–sour spreads, adding liquidity to the market and creating greater efficiency in price discovery of sour crude oil.[59] Finally, and most importantly, the contract is physically backed, ensuring a linkage between the futures and the physical marketplace and building market confidence in the price-discovery mechanism.

In a historic move on 14 November 2006, the Sultanate of Oman announced its intentions to price its physical crude off the DME Oman futures contract, in lieu of using the OTC market assessments — the first Middle East producer to commit to do so. Publicly announcing the need for price transparency in sour crude oil and the producer's support for the DME, Dr. Mohammed Hamed Al Rumhy, Oman's Minister of Oil and Gas, stated:

> We believe this [DME Oman crude oil futures] is one of the most significant developments in the Middle Eastern oil market for years, addresses industry needs, and is entirely appropriate given Oman's role in pricing the region's crude oil. By pricing Oman's crude oil directly off the Oman crude oil settlement price when it starts trading on the new exchange, we are giving a resounding and unequivocal demonstration of our commitment to the DME's long-term success.[60]

As of 21 June 2007, open interest in the DME had grown steadily to 6,236 contracts, reflecting 6.2 million barrels of Oman crude oil in open or outstanding positions (see Figure 4.24). Open interest is a strong indicator of success in a futures contract as it reflects trades which are left open and not closed; customers take risk in holding their individual positions overnight if they do not close their positions.

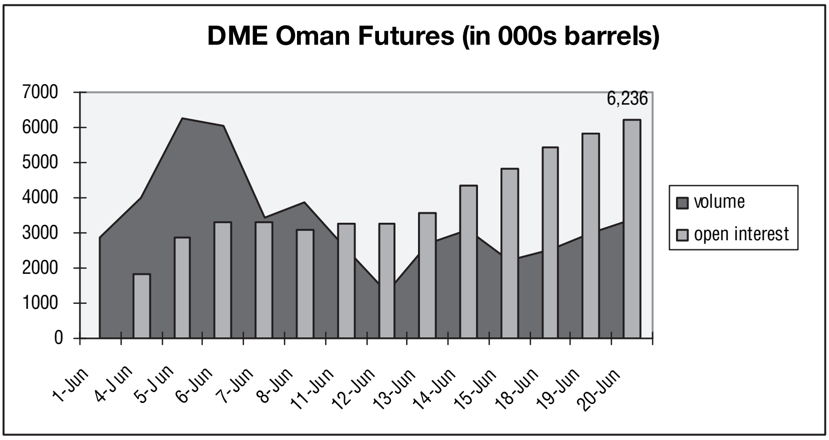


FIGURE 4.24 Open interest builds in DME Oman crude-oil futures

At the time of writing, many market participants were eagerly awaiting the DME's first monthly (June) settlement of the region's first physically deliverable sour crude-oil futures contract. Once the exchange clearing house had successfully matched buyers and sellers who have opted to go for physical delivery of Omani crude oil at the Mina Al Fahal terminal in Muscat, and the first few cargoes are delivered without disruption, the search for price discovery of Middle East crude would finally be over.

The largest producers in the Middle East are currently using the Platts OTC assessment of Dubai and Oman crude to set their official selling prices (OSPs). However, with the launch of the DME Oman futures contract on 1 June 2007, both the governments of Oman and Dubai have pledged to price their respective crude-oil cargoes off the average of DME Oman futures. Assuming the DME is able to operate successfully as a futures exchange, it will only be a matter of months before the entire region begins to price all of its crude sold to Asia, over 12 million barrels per day, off the DME Oman futures settlement price. Once the rest of the Arab Gulf producers have started using DME Oman futures to set their OSPs, the Asian buyers will also commit to hedging their crude-oil purchases off the new price-discovery mechanism for sour crude oil, effectively beginning a new era in crude-oil pricing.

CONCLUSION

There is increasing urgency for a sustainable price-discovery mechanism in Middle East sour crude oil that is liquid, transparent and well regulated. Today, the majority of the world's crude-oil production — sour crude oil from the Middle East — flows east towards the emerging economies of Asia, the fastest-growing consumer of sour crude oil. Unlike the liquid, well-regulated and transparently priced futures benchmark for sweet crude oil, Middle East sour crude oil sold to Asia is priced based on a thinly traded and unregulated over-the-counter market in Singapore. The backbone of this price-discovery mechanism is Dubai (Fateh), a crude-oil stream with less than 100,000 barrels of production per day. In addition, Middle East crude sold into Europe or North America is priced at a freight and quality differential to the western benchmarks of Brent and WTI, respectively. Both Brent and WTI are sweet-crude benchmarks in production decline, and do not accurately represent the supply-and-demand fundamentals of the East of Suez market. Despite contributing more than 18 million barrels per day to world crude-oil markets, Middle East sour crude oil does not have its own locus of pricing in the region where it is produced. Efforts by price-reporting agencies to improve the liquidity and transparency in the OTC price discovery of Middle East sour remain short-term solutions to a long-term problem which shows no sign of subsiding. Increasing volatility in global crude-oil prices, driven by a multitude of supply-and-demand fundamentals, further exacerbate the need for price-risk management by traders, refiners and end-users of sour crude oil. The question remains: how will the market solve its need for price discovery?

A futures market in Middle East sour crude oil is the only long-term, sustainable solution to the region's need for price-risk management as it will result in the creation of a forward curve, similar to that of WTI or Brent forward curves, and more accurately reflect supply-and-demand fundamentals for sour crude oil. With constant access to sour crude-oil pricing information, producers will be able to price their sales and consumers will be able to hedge their purchases more effectively. No longer will their primary means of price discovery rely on pricing at a differential to sweet crude oil trading in the West. If regional developments, such as the recently launched Dubai Mercantile Exchange, succeed in making Oman crude oil the region's price benchmark, there will be a new locus of pricing for the majority of the world's crude oil. This will happen faster than the world expects.

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Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 5

Emissions Trading — Towards a Global Carbon Market

The global market in physical carbon trading tripled in 2006, to US$30 billion, with London's Intercapital brokers reporting their broking activity at two million MT of carbon derivative contracts a day.

The bulk of carbon trading, some US$25 billion, was carried out through the sale of allowances under the European Union's Emissions Trading Scheme (EU ETS), which covers industries pumping out large amounts of carbon dioxide.

In 2006 and 2007 the carbon market witnessed unprecedented growth in this asset class, not only from industrial companies but also from newer participants — commercial firms, banks and financial institutions that recognize the attractiveness of this market for managing risks and earning returns on capital.

Speaking ahead of the G8 summit of industrialized nations in June 2007, business leaders from the energy industry called for global carbon markets to help tackle climate change. They said they wanted a market in which carbon prices were transparent and consistent. "I believe that unlocking the ability of a competitive market to innovate and change behaviors will achieve the least cost solution to climate change," said Tony Hayward, the chief executive of British Petroleum (BP).

Energy-sector leaders are keen that there should be a single price for carbon emissions throughout the world. Simply put, the idea of carbon trading is that firms can either cut emissions or buy the right to keep polluting.

As of June 2007 there is no global carbon market but industry talks and politics seem to be pointing in this direction. One route open to politicians will be to create links between various regional markets and the Kyoto framework agreement: for example, links allowing for the transfer of credits between the EU ETS in Europe, North and South American carbon markets and the creation of an Asian carbon-trading market which would also encompass Australia and New Zealand.

TOWARDS GLOBAL CARBON MARKETS

The first steps towards a global carbon market were executed on 1 January 2005 when the EU ETS came into being. Following this, the energy markets would never be the same. Prior to emissions trading, traders and energy buyers only had to focus on delivery time, quality of material, and price; but now the cost of emissions for using that fuel also had to be added to this. Now companies using and producing energy have to consider the "carbon footprint" of their fuel of choice. The more carbon they produce, the more carbon credits they must have to cover their requirements or face stiff financial fines imposed by their respective governments.

No longer could industry or traders depend on the simple arithmetic of oil, gas, power and coal prices to choose the "best deal". From this point onwards, energy producers, industry and traders alike had to examine the emission cost of their energy production/source as a key part of their financial decision-making process. For example, a company may have a choice of two fuel sources, one of which may, on the face of it, appear cheaper than the other. However, once the emissions costs based on the emissions generated by that fuel are factored in, the seemingly more-expensive of the two may, in fact, prove to be the cheaper.

The European scheme operates under the guidance of the Kyoto Protocol, which was signed by the majority of industrialized nations to target reductions in greenhouse-gas (GHG) emissions.

THE EUROPEAN REGIME

Signed in December 1997, the Kyoto Protocol is the international agreement intended to reduce emissions of greenhouse gases (especially CO_2, methane and CFCs) in developed countries. The Protocol requires, for example, that the European Union reduce its emissions by 8% below 1990 levels by 2012, which equates to a reduction of 340 million tonnes of CO_2 emitted into the atmosphere.

The emissions-trading scheme started in the 25 EU Member States in January 2005, and after the launch value of approximately €5 per MT of CO_2, the price rose quickly to a high of around €30 per MT in mid 2005.

If we take an average value of €20 per MT of CO_2 emission credits, the EU ETS was handling emissions credits worth €6.8 billion just after its launch. A key aspect of the EU scheme is that it allows companies to use credits from Kyoto's project-based mechanisms — joint implementation (JI) and the clean-development mechanism (CDM) — to help them comply with their obligations under the scheme. This means the system not only provides a cost-effective means for EU-based industries to cut their emissions but also creates additional incentives for businesses to invest in emission-reduction projects elsewhere; for example, in developing nations such as China and India and in South America and Africa. In turn, this spurs the transfer of advanced, environmentally sound technologies to other industrialized countries and developing nations, giving tangible support to their efforts to achieve sustainable development.

Given the discussions and announcements made by the G8 group of industrialized nations in June 2007 that they were looking to cut emissions by 50% by 2050, politicians have woken up to the importance of this issue to the voting public and are taking seriously the need for a global carbon market. Whether this eventuates in a few years or in 10 years, it seems clear that it will happen, probably through the creation of various link agreements between a federal carbon-trading market in the United States, an Asian-based carbon-trading market that includes Australia and Japan and China, and the existing EU ETS under Kyoto.

The long-term impact of these market-based solutions has been to reduce pollution in a cost-effective manner and accelerate the introduction of more environmentally benign technologies. We have already witnessed the introduction of emission-reduction technologies across Europe financed partly, or in some cases wholly, through the later sale of excess carbon credits accumulated by companies. (Where companies are able to cut emissions faster than required by legislation, they can then sell these credits to others which have not been able to do so.)

Emissions-trading markets are not true commodity markets in that they are "cap and trade", which means that emissions are ratcheted down over time. For the U.S. sulfur dioxide (SO_2) markets, this involves a 35-year regime of reductions and more stringent standards until the year 2030. For CO_2 and other GHG reductions, we will need a 100-year program that engages the entire world and sets quantifiable long-term benchmarks to reduce emissions. Implementation of the Kyoto Protocol was a modest first step to global emissions reductions, but the larger question is whether there will be significant CO_2 reductions in the next two decades to meet carbon stabilization in the atmosphere. The reality is that the entire world is in this for the long haul. There is no quick technological fix as long as the world is addicted to fossil fuels, whose consumption is still rising. That habit is not going to change, as has been evidenced in the past year with record oil, coal and natural-gas consumption despite higher prices. We need a climate-change regime that will aggressively reduce global carbon intensity, including both stationary and mobile sources, accelerate technology transfer, and increase energy efficiency.

And, contrary to what many believe, the U.S. will lead in this effort. Yes, the world's biggest polluter, which did not sign the Kyoto Protocol, is actually leading many of the greenhouse-gas trading and reduction schemes.

Already, commodity CO_2 used for enhanced oil recovery in Texas and Wyoming is now married to carbon sequestration efforts in those states. The use of naturally depleted geologic formations is being pushed forward by the oil industry and the U.S. Department of Energy. Again, unknown to most of the world, the U.S. is leading the way in these green efforts.

In 2006, British Petroleum announced a project in the United Kingdom whereby it will remove CO_2 from natural gas extracted from the North Sea before burning it in an onshore power station. It will then use the existing pipeline to transport the CO_2 back out to sea for storage in a nearby depleted oil field. This is just part of BP's plans for the "de-carbonization" of fuel.

While a global carbon and GHG market will eventually develop, this will first require a federal carbon-trading scheme in the U.S. This is now beginning to come to about. Federally mandated standards are needed to create fungible commodity markets so that the rules bring a realistic financial value to emissions reductions. The point is that both the SO_2 and nitrogen oxide (NOx) programs are mandated and have financial penalties for non-compliance. Today's low carbon prices reflect the market valuation of "voluntary" standards. Companies would rather sit on their carbon inventories today as prices will surely appreciate tomorrow.

Another driver behind the GHG market is that we now have a situation where institutional shareholders are forcing corporations to acknowledge the environmental risk on their books. This has been done mostly by pension funds and is similar to the strategy that proved quite effective in tobacco litigation. There are also several efforts being made through litigation to get the U.S. federal government to change its present oppositional position.

The European program is a company-to-company cap-and-trade program, and the tradable unit is EU allowances. We have seen over three million tons traded on the Chicago Climate Exchange (CCX), with more than 80 companies participating, and carbon trading at less than US$2 per ton. However, many larger trades, including a one-million-ton trade by electric utility Entergy in December 2004, have been traded on the OTC i.e. bilaterally traded market (directly traded between market counterparties). We have also seen the emergence of several green hedge funds that will actually trade carbon and renewable-energy credits speculatively.

So where can a company go to trade carbon credits — that is, to sell accumulated credits or to buy additional credits when necessary ?

THE CARBON EXCHANGES

The EU did not invent emissions trading. The U.S. began trading emissions for sulfur dioxide in March 1995 under the oversight of the U.S. EPA, and added NOx trading in 1999 as a federal program.

Emissions trading was made in America, and proposed by the U.S. delegation at the Rio Climate Convention Treaty in 1992 despite the fact that, in the end, the United States did not sign up to the Kyoto Protocol that followed the early discussions in Rio.

At present, credits for GHG emissions are traded in 10 notable exchanges/markets, all of which, with the exception of the EU ETS, are commercial exchanges.

- The Chicago Climate Exchange (CCX), which opened in December 2003
- The Chicago Climate Futures Exchange, a CCX subsidiary, which opened in December 2004
- The EU ETS, which opened in January 2005
- The European Climate Exchange (ECX), a CCX subsidiary based in London, which opened in April 2005
- Nord Pool, which began trading and clearing European Union Allowances (EUA) in November 2004
- Powernext, the power and carbon exchange in France
- EEX, the energy exchange in Germany
- EXAA, the Austrian energy exchange

- The New York Mercantile Exchange (NYMEX), based in New York
- The Intercontinental Exchange (ICE)

Participants in these markets include companies that want to buy emissions allowances to achieve compliance or to sell their own surplus allowances for profit; municipalities and other units of government; financial institutions that trade for profit; private individual investors; and projects that have been created under the Kyoto Protocol.

These markets are similar to the U.S. SO_2 and NOx markets discussed earlier. Together they demonstrate that cap-and-trade schemes are an effective tool for helping individual parties achieve their emissions-reduction targets and for achieving overall reductions in emissions — in both regulated and unregulated markets. This chapter sketches the origins and development of these markets and explains how they operate.

CHICAGO CLIMATE EXCHANGE (www.chicagoclimatex.com)

Mission and origins

The CCX is a voluntary but legally binding GHG emissions-trading program intended to encourage and develop the institutions and skills needed to manage GHG emissions in the absence of government regulation and to demonstrate that companies will reduce emissions voluntarily. Its mission is to "provide members from the private and public sectors with cost-effective methods for reducing their greenhouse gas emissions by building and operating a market-based emission-reduction and trading program that is flexible, has low transaction costs, is environmentally rigorous and rewards environmental innovation".

The Exchange grew out of a feasibility study conducted in 2000 by Northwestern's Kellogg Graduate School of Management and Environmental Financial Products under a grant from the Joyce Foundation in Chicago. The study concluded that a pilot program for a North American trading market was feasible for unregulated emissions. In August 2001, another grant permitted the researchers to examine how a market could be created. Forming an advisory board and recruiting firms to help develop market rules were among the principal tasks. On 12 December 2003, CCX began continuous electronic trading of GHG emission allowances.

In 2003, CCX launched trading operations, with the following 13 Charter Members:

- American Electric Power
- Baxter International Inc.
- City of Chicago
- DuPont
- Ford Motor Co.
- International Paper
- Manitoba Hydro Corp.
- MeadWestvaco Corp.
- Motorola Inc.
- STMicroelectronics
- Stora Enso North America
- Temple-Inland Inc.
- Waste Management Inc.

Through their CCX membership, the above organizations were the first in the world to make legally binding commitments to reduce all six greenhouse gases, in the world's first multinational multi-sector market for reducing and trading GHGs.

Membership

While participation in the CCX is voluntary, many members have joined in order to publicly express their commitment to environmental values — both in terms of corporate social responsibility and to demonstrate the responsible management of environmental risks that could give them a competitive advantage. Participation also motivates members to increase their energy efficiency and learn how to manage emissions better — lessons likely to be useful if federal and/or state governments do regulate GHG emissions.

CCX members act as buyers (usually companies or municipalities that emit GHGs); sellers, who have emissions offsets; and traders, who help provide market liquidity.

CCX offers four classes of membership:

- Members, who emit GHGs from facilities within North America
- Associate Members, who have small or no direct GHG emissions but commit to CCX compliance by offsetting business-related emissions

- Participant Members are offset providers who are project owners or implementers, registered aggregators, or parties selling exchange offsets; or liquidity providers who are trader groups, brokers or market makers
- Exchange Participants, who are non-U.S. parties that have an account for acquiring traded allowances.

As of June 2007, CCX had more than 200 members (up from around 70 in March 2005) and more than 35% of these are registered liquidity providers to the contracts traded.

Emissions-reduction targets

CCX emitting members make a voluntary but legally binding commitment to meet annual GHG emission reduction targets. Those who reduce below the targets have surplus allowances to sell or bank; those who emit above the targets comply by purchasing CCX Carbon Financial Instrument™ (CFI™) contracts.

The commodity traded at CCX is the CFI contract, each of which represents 100 metric tons of CO_2 equivalent. CFI contracts comprise Exchange Allowances and Exchange Offsets. Exchange Allowances are issued to emitting members in accordance with their respective Emission Baselines and the CCX Emission Reduction Schedule. Exchange Offsets are generated by qualifying Offset Projects.

Companies can meet their reduction targets by physically reducing their own emissions on site; by purchasing allowances from other members of the exchange; and by purchasing credits from offsetting projects such as landfill and agricultural methane sequestration in soils, and forest biomass, as explained below

Units of trade and data management

While, technically, CCX covers the six GHGs listed in the Kyoto Protocol, only CO_2 is monitored and offset through CCX. All trades, measurements, price quotes and reporting on CCX are in metric tons of CO_2 equivalents. All other gases are converted into metric ton CO_2 equivalents based on the 100-year Global Warming Potential (GWP) established by the Intergovernmental Panel on Climate Change. The GWP permits comparison of how much heat each GHG traps in the atmosphere. The CO_2 equivalent number is the ratio of heat trapped by one unit mass of the gas to that of one unit mass of CO_2 over a specified period of time

To standardize trades, CCX developed the Carbon Financial Instrument, equivalent to 100 metric tons of CO_2. The Instrument comes in two forms:

- Exchange Allowances (XAs), issued to both Exchange and Associate Members according to their baseline emissions for carbon sequestration in forests and reductions in electricity use.
- Exchange Offsets (XOs), issued by other mitigation projects registered with CCX by Participant Members. Exchange Offsets are always issued after CO_2 reduction has occurred and the requisite documentation has been presented. Initially, eligible projects included landfill methane and agricultural methane destruction in the United States; carbon sequestration in U.S. forestry projects and agricultural soils; and fuel switching, landfill-methane destruction, renewable energy, and forestry projects in Brazil.

All Carbon Financial Instruments are recorded in a registry maintained by CCX with a designated annual vintage and can be banked from year to year. Reporting is done quarterly.

CCX is also making efforts to work with other groups towards harmonizing measurements and audits for the market as a whole. CCX members can now submit data for use in the World Economic Forum's Global Greenhouse Gas Register, as long as they also submit relevant data on indirect emissions and emissions from jurisdictions not covered by CCX. Global harmonization of all these conflicting standards for greenhouse gases is the crux of the problem preventing a global fungible GHG regime from coming into place.

How the CCX manages trades

The CCX Electronic Platform is open for trades from 10am to 12:30pm (Central Standard Time), Monday through Friday. The National Association of Security Dealers, a private-sector regulator of the U.S. securities industry, audits members' baselines and annual emissions and regulates the CCX Trading System, monitoring for fraud and market manipulation.

- *The Electronic Trading Platform*. Trading occurs only on this platform, and only account-holding CCX members are eligible to trade on it. The platform is a price-transparent market, with all order sizes, market depth and a market ticker viewable at all times. Trades can be executed on the open market, with exchange clearing or bilateral trades negotiated privately apart from the platform.

- *The Clearing and Settlement Platform*. This platform processes transactions from the Electronic Platform, to net out positions and produce payment instructions. The Clearing and Settlement Platform also provides daily statements to members.
- *The CCX Registry*. In conjunction with the two platforms, this creates real-time data for all account holders.

CHICAGO CLIMATE FUTURES EXCHANGE (www.chicagoclimatex.com)

In late 2004, CCX developed a subsidiary called the Chicago Climate Futures Exchange which, in December that year, launched sulfur financial instruments which standardized and cleared futures contracts for trading SO_2 emissions allowances. SO_2, a regulated emission, has been traded over the counter since 1990. As a futures contract, sulfur financial instruments are designed to help manage price risk and fluctuation of SO_2 allowances in conjunction with OTC trades. Contracts are for 25 tons of $S0_2$ emission allowances, a volume which has been criticized by industry participants as being too small and which, they say, should be 100 tons.

NYMEX (www.nymex.com)

While the impact of global climate change poses a significant market challenge for both the energy and agricultural industries, these industries have incredible market opportunities in renewable energy and emerging green financial markets. The U.S. has been the leader in establishing liquid environmental-trading markets for SO_2 since 1995 and for NOx since 1999, and now has the opportunity to introduce financial futures for these commodities. Greenhouse gases offer a global opportunity for creating carbon as a fungible commodity in much the same way as has happened for crude oil. The New York Mercantile Exchange, with its dominance as the energy futures exchange, its clearing house function and brand recognition, has the opportunity to become the premier green exchange. The market opportunity is US$10 trillion, with environmental financial contracts touching all NYMEX fossil-fuel contracts in oil, gas, power and coal. NYMEX has launched a range of emissions contracts on its Clearport Clearing and trading platform. Full specification details can be found at www.nymex.com/cp_produc.aspx

Nitrogen Oxide (NOx) Emissions Futures

Trading Unit: 10 short tons of NOx emissions allowances.

Nitrogen Oxide (NOx) Banked Emissions Futures

Trading Unit: 10 short tons of NOx ozone-season emissions allowances of the years for which the compliance year trading deadline has passed and are not early reduction credits.

Sulfur Dioxide (SO_2) Emissions Futures

Trading Unit: 100 short tons of SO_2 emissions allowances.

THE EUROPEAN UNION EMISSIONS TRADING SCHEME

As described earlier, the EU ETS is a cap-and-trade program was launched in January 2005 and designed to reduce GHG emissions in compliance with Kyoto Protocol targets. The scheme is designed to achieve the lowest possible abatement costs and permits both Joint Implementation and Clean Development Mechanism projects.

The EU must lower emissions by 8% overall. The percentage reductions assigned to each country aren't sensitive to scale, so it's necessary to look at the tons of CO_2 that must be reduced to determine where the primary buyers will come from. Larger, more-developed countries such as Germany and Italy will share the bulk of actual reductions. The fact that a large share of the burden falls on relatively few countries makes accurate competitive pricing all the more important to guarantee reaching overall EU targets.

Under the umbrella of the European ETS several exchanges have emerged to offer a trading platform for trading spot and futures/forward markets in European emission credits. The scheme is not itself a trading platform. Below, we take a detailed look at some of the more noteworthy European exchanges, all of which offer trading in ETS credits.

THE EUROPEAN CLIMATE EXCHANGE (www.europeanclimateexchange.com)

The players

While the EU ETS has set the ground rules for carbon dioxide emissions reductions for the EU, the reality is that several exchanges have sprung up to participate in the actual trading scheme. One is the European Climate Exchange (ECX), a subsidiary of the Chicago Climate Exchange. It was launched in April 2005 and has created a venture in which its trades will use both the electronic technology and the clearing mechanism of the IntercontinentalExchange's ICE Futures, the second-largest energy-futures exchange in the world. The ICE Futures exchange went totally electronic in April 2005 and closed its floor-trading operation. This turned out to be a good move, with volume increasing; a move watched closely by its arch competitor, the New York Mercantile Exchange, which launched a London trading floor in September 2005, only to close floor trading and go electronic in the first quarter of 2006. Subsequently, NYMEX de-registered the London exchange from the Financial Services Authority (the United Kingdom's equivalent of the CFTC) at the end of 2006, leaving only a marketing presence in London.

The ECX offers carbon financial instruments (CFIs) to companies all over the world. These are advanced, low-cost and financially guaranteed tools for trading emission allowances issued under the EU ETS.

ECX products are listed by ICE Futures and traded on its electronic platform, offering a pan-European platform for carbon emissions trading with standard contracts and clearing guarantees provided by LCH.Clearnet.

More than 50 leading businesses, including global companies such as ABN AMRO, Barclays, BP, Calyon, E.ON U.K., Electrabel, Fortis, ICAP, Morgan Stanley and Shell, have signed up to trade ECX products.

The ECX has agreed to cooperate with France-based Powernext to give participants access to both ECX's futures and Powernext's spot contracts on a single screen.

The ECX was selected because many emitters are members of the IPE. ECX trades made on the Interchange are executed and financially guaranteed by London Clearing House's LCH.Clearnet Limited, eliminating the need for a third-party credit-risk-management program.

Futures contracts are traded on ECX. A futures contract is an agreement on the part of the buyer and the seller that calls for the seller to deliver to the buyer a specified quantity and quality of an identified commodity, at a fixed time in the future, at a price agreed to when the contract is first entered into. For the ECX CFI futures contracts traded on ICE Futures, the underlying market is the EU Emissions Trading Scheme. ECX CFIs have the normal characteristics of futures contracts and are financially guaranteed by the LCH.Clearnet.

Each instrument futures contract is for 1,000 tons of CO_2 emissions; the minimum price per ton is €0.05; each contract is for a minimum of €50. Eligible emissions contracts are delivered to EU member-state registry accounts with IPE. Contracts are quarterly for the first time period of the EU ETS and annual for the second period. EU ETS accepts Certified Emissions Reductions (CERs), which come from CDM projects under the Kyoto Protocol, but for regulatory and logistical reasons does not allow trading in CERs.

Commodity markets need simplicity to engender replication of trade and they need focused liquidity. The complexities involved in implementing the Kyoto Protocol cannot be overemphasized. Getting these markets to work is a major challenge, and the proliferation of exchanges in Europe could be an impediment to market liquidity. It may be that the ECX has the best chance of achieving market liquidity because of its link to the ICE. ECX is working with EU member states with the largest emissions — France, Germany and the United Kingdom — to develop smooth reporting of allocations and efficient trade clearing.

Both the CCX and the ECX have developed standardization and verification protocols on open exchange platforms through the creation of the carbon financial instrument and partnerships with other exchanges. While CCX paves the way for North America's as-yet unregulated emissions trading, ECX provides market consolidation that will lower the marginal cost of abatement for parties required to reduce emissions.

USING FUTURES CONTRACTS TO HEDGE RISK

Hedging is the act of taking equal and opposite positions in the cash and futures markets to protect a cash-market position against loss arising from price fluctuation. It is frequently referred to as a temporary substitute for a purchase or sale. In anticipation of buying or selling the cash commodity, the hedger buys or sells futures contracts.

Because the cash and futures prices tend to rise and fall together, the futures market provides the medium for commodity owners and users to hedge against adverse price risk. With opposite positions in the cash and futures markets, price losses in one market will be approximately offset by gains in the other.

There are two types of hedges: the buying, or "long", hedge, and the selling, or "short", hedge. In a buying hedge, futures contracts are bought in anticipation of a later purchase in the cash market. A buying hedge is used by individuals to protect against an increase in the price of the cash commodity that they will buy (or expect to buy) at a future date.

The selling hedge is used by those who are trying to protect against declines in the price of a commodity they own or will produce for sale at a later date. For example, if an energy company has sold futures contracts against its emissions-allowance inventory, it has established opposite positions in the cash and futures markets. It is long in the cash market because it owns allowances, and it is short in the futures market because it has sold futures contracts. If prices decline, the hedger will realize a lower price in the cash market when it sells the allowances. However, this loss will be offset by the profit realized when it buys back the futures contract at a lower price.

NORD POOL (www.nordpool.com)

The Nordic Power Exchange (also known as Nord Pool) started trading and clearing European Union Allowances (EUAs) in March 2005, when national registries were listed. The EUA forward contracts listed on Nord Pool go to physical delivery. Nord Pool Clearing acts as counterparty in all exchange trades, guaranteeing cash settlement of the contracts. Nord Pool uses its Power Click technology platform, which it has installed with many of its customers across Europe. Nord Pool is the most successful electricity-futures exchange in the world and also clears OTC contracts but, compared to ECX and Powernext, has struggled to capture trading volume as quickly as the competition.

The Contracts	
Commodity	European Union Allowances (1 EUA = 1 tCO_2)
Ticker code	EUAmth-yr & EUADddmm-yr
Denomination	EUR/tCO_2
Contract size	1000 tCO_2
Minimum tick size	EUR 0.01
Contracts	Forwards from 2006-2012 with December (and March) delivery and Spot (Day-ahead)

Trading	
Training model	Continuous trading
Trading system	PowerCLICK™ via internet or fixed line
Opening hours	08.00-15.30 CET
Support/voice broking	Manual trade available through Nord Pool help desk
Trading confirmation	Every trade online registered in company trade list in PowerCLICK™. Online Clearing reports available via internet
Fees	See separate fee list

FIGURE 5.1 Nord Pool EU Allowances Trading and Clearing Services — Forward and Spot Market

POWERNEXT (www.powernext.fr)

Powernext Carbon offers an organized spot market enabling exchange of allowances and non-compliance risk management.

This market is based on four principles:

- straight-through process from transaction to delivery
- price transparency
- non-discriminatory access to the market and complete anonymity for participants
- guarantee of transaction performance based on a settlement mechanism which secures payment and quota delivery.

In December 2004, Caisse des Dépôts, Euronext and Powernext signed a letter of intent to pool their expertise in setting up a spot market of carbon dioxide. Under this arrangement, Powernext operates Powernext Carbon market, authorizes members, provides a continuous trading platform and lays down the market rules. A department of Caisse des Dépôts — separate from the Registry function — manages the delivery-versus-payment (DVP) mechanism and acts as intermediary, guaranteeing the payment and delivery commitments agreed by members while trading. Euronext is involved in developing the model and lends its authority to the project.

Powernext Carbon is a spot market of CO_2 equivalent tonnes quoted in euros. These contracts are governed by the French commercial law for trading in goods (in this case, "movable property") and are not covered by provisions applicable to markets for financial instruments

EEX (www.eex.de)

In October 2005, the European Energy Exchange AG (EEX) launched futures trading in EU emission allowances, having adopted the required changes of the rules and regulations the previous month, thus paving the way for the CO_2 derivatives market. The newly listed European carbon futures are denominated in 1,000 EU emission allowances of the first and/or second trading period. The tradable maturity is the month of December for each of the following years, up to and including 2012. EEX had already introduced a spot market for emission allowances in March 2005.

These futures will enable the trading participants to hedge prices of emission allowances, with the EEX clearing house assuming the counterparty risk. The EEX also offers clearing of futures transactions concluded over the counter between counterparties. Within the framework of this so-called OTC clearing, EEX cooperates with several renowned brokers and wishes to repeat the success achieved in OTC clearing of futures transactions in German electricity.

The EEX operates a spot and a derivatives market for energy and energy-related products and, with 128 trading participants from 16 countries, boasts the highest number of trading participants and the biggest turnover in Europe. In addition to electricity and futures options on electricity, trading in CO_2 emission allowances commenced in March 2005. The range of services provided by EEX is complemented with related services such as the joint clearing of exchange transactions and OTC transactions.

EXAA (www.exaa.at)

Austria's electricity market was fully liberalized in October 2001. Just one year later, the gas market was also opened up, making Austria one of the front-runners in the process of liberalizing energy markets in the European Union. EXAA (Energy Exchange Austria), located in Graz, is an essential component of the new market system in Austria. EXAA's shareholders comprise the Vienna Stock Exchange (Wiener Börse AG), as the commodity exchange, system providers and electricity utilities.

With its fully electronic trading platform, the Austrian Energy Exchange ensures easy access for all market players. Small electricity utilities, as well as big electricity traders and industrial consumers, can enjoy the advantages of trading at the exchange via the Internet. Naturally, this is not limited to Austrian market participants. In general, it is readily available to any company that wants to take an active part in the European electricity market. In the future, EXAA also intends to address neighboring regions, especially EU-candidate countries from Southeastern Europe.

With the primary goal of ensuring transparency in the organization of the Austrian electricity market, spot trading was introduced according to plan and officially launched in March 2002.

EXAA extended its portfolio of products traded by adding CO_2 Emission Certificates in June 2005. (The EU-directive 2003/87/EG allows trading with emission allowances.)

According to the Austrian emissions certificate law (*Emissionzertif ikategesetz*), carbon emissions allowances are considered to be goods, which enables the trading of those certificates at EXAA as a commodity exchange.

In fact, across most of the world CO_2 and other emission credits are considered to be assets which could be applied in repo finance structures to obtain cheaper secured lending from banks.

As in the energy market, EXAA guarantees as a central counterparty (the central counterparty assumes the financial risk of default by sellers and buyers and guarantees the anonymity of deals concluded) the fulfillment of all open positions. Furthermore, it guarantees the physical delivery of the certificates.

Eight participants kicked off the market, including companies which are affected by the Kyoto Protocol. Electricity utilities, such as the Swiss Energiegesellschaft Laufenburg AG (EGL) and the Österreichische Elektrizitätswirtschafts-AG (VERBUND), have been members at the EXAA energy spot market for a long time. Remarkably, two affected Austrian industrial companies, Tondach Gleinstätten AG and the glass manufacturer D. Swarovski & Co., will take part in trading.

At EXAA, CO_2 certificates that are used for covering emissions in the pre-Kyoto trial period from 2005 to 2007 (EUAs) are traded. The auction takes place on Tuesday each week. As well as the proven trading system from the EXAA Energy Market, the new trading engine for CO_2 certificates uses Internet communication.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 6

Options Trading and Hedging Application Strategies

Energy "options" go one step further than a simple on-exchange futures contract or even an OTC fixed- or floating-swap contract. They can be compared to insurance policies, because there is a premium to pay but if the market moves against you there is no requirement to pay any more money. When a family takes out a policy on the contents of its home, it is purchasing the right (or the option) to claim replacement goods if the house gets burgled. In the same way, the purchaser of an energy option is buying the right to claim price protection (or benefit as a trader) from the seller of the option if the price of the chosen energy market rises above the price specified in the contract (the "strike price").

An option is exactly what the name implies: when traders buy oil options, they buy the right, but not the obligation, to purchase a certain amount of an energy market (oil, gas, power, coal) at a certain price at a certain future date. This means that the user can set a maximum price it would like to pay for the energy in December, for example, and then buy an option at that price. If somebody sells the buyer that option, they have promised to supply a particular amount of energy, in December, at that particular price.

The majority of derivative options are never linked to the physical delivery of energy, but merely give the user the benefit from the exposure to the cash flow of an equivalent position in the underlying energy. As discussed in Chapter 3, only a very small percentage of exchange-traded futures contracts go to actual physical delivery: somewhere between 2% to 5% of total open interest.

Derivative-option structures enjoy several advantages over and above a straightforward futures and/or swap structure:

- The initial cash outlay when buying an option structure for speculation or hedging purposes is, in many cases, restricted to the premium paid. It's similar to home or motor insurance, for which you pay a fixed premium each year and if something happens the insurance pays out. One of the key elements of option pricing is time value; that is, how long the option has until its expiry. As a result, companies such as airlines or other major consumers of energy who need to protect for periods of a year or longer often make use of the popular "Zero Cost Collar Structure". This enables them to buy a cap and sell a floor option or sell a cap and buy a floor as part of their hedging strategy. Through the sale and purchase of options sometimes the premium paid out can be zero cost. This structure is very common among end-users with an energy price risk, who are exposed to energy prices moving higher and so need to buy caps (calls) and sell floors (puts) in order to create zero-cost protection against prices moving higher. We will be discussing this structure in detail later in the chapter.
- There is less opportunity cost involved when using option structures than in a swap or futures strategy, because option strategies can enable the user to protect against adverse price-risk movements, but at the same time still benefit from beneficial price movements in the underlying physical energy market.
- Another advantage of option strategies is that traders who are unsure about the outright price direction of an underlying asset can take a position on volatility rather than market price.

Key terminology used in on-exchange and OTC options markets

American option: An option which can be exercised on any business day up to and including the expiry date. More expensive than European options.

Asian option: The main option found in the OTC energy markets. They are called "path-dependent" because their final value is dependent on the path of the underlying energy market (for example, in a December option, the option will eventually price out against the average price of the energy market on which the option is based, over the whole month of December, similar to a whole-month averaging swap). Basically, the profit from an Asian option depends on the price history of the underlying commodity that is being used as the price reference, over all or part of the life of the option. The advantage of this type of option is that if the market moves against the option position (price movement) the only cost or loss of opportunity would be the cost (or premium) of the option. However, with a swap position you would be locked in and have potentially unlimited "opportunity cost", if the market moved against the derivative position. These are normally cheaper than American-style or European-style options.

At-the-money (ATM): Option whose exercise price is the same as the market price of the underlying energy.

European option: An option which can be exercised on the expiry date only. Cheaper than American options.

Fair value: The combination of intrinsic value and time value, as calculated by an option-pricing model.

In-the-money (ITM): A call is said to be "in-the-money" when the value of the underlying energy futures or swap price is higher than the option's strike price. A put is "in-the-money" when its strike price is higher than the value of the underlying energy futures or swap price.

Intrinsic value: The difference between the strike price and the current market rate.

Out-of-the-money (OTM): A call is "out-of-the-money" when the value of the underlying energy futures or swap price is less than the option strike price. A put is "out-of-the-money" when its strike price is less than the value of the underlying energy futures or swap price.

Premium: The price or cost of the option.

Strike price: The entry price into the underlying participation level.

Time value: The difference between the option premium and the intrinsic value, including time until expiry, volatility and cost of carry (interest %).

Value date: Date when the underlying is settled or delivered.

VOLATILITY

Volatility plays an important part in the pricing of an option strategy, and in evaluating whether an option is too expensive to purchase. There are two types of volatility:

- Historical volatility — the normalized, annualized standard deviation of the underlying energy futures/swap contract
- Implied volatility (IV) — the volatility value placed on an option premium quotation from a trader or market maker. When an option quote is received, the premium value can be put into an appropriate option model to calculate some idea of the implied volatility that the other trader or market maker considers appropriate for this trade. In most cases, the higher the IV, the higher the premium of the option. By comparing data from volatility and implied volatility, judgment calls can be made on whether IV is looking expensive. A simple scenario: if you buy an option when IV is very high, and then afterwards the market does not move but IV drops, you will most probably find the value of the option you purchased will have reduced (all other factors remaining equal).

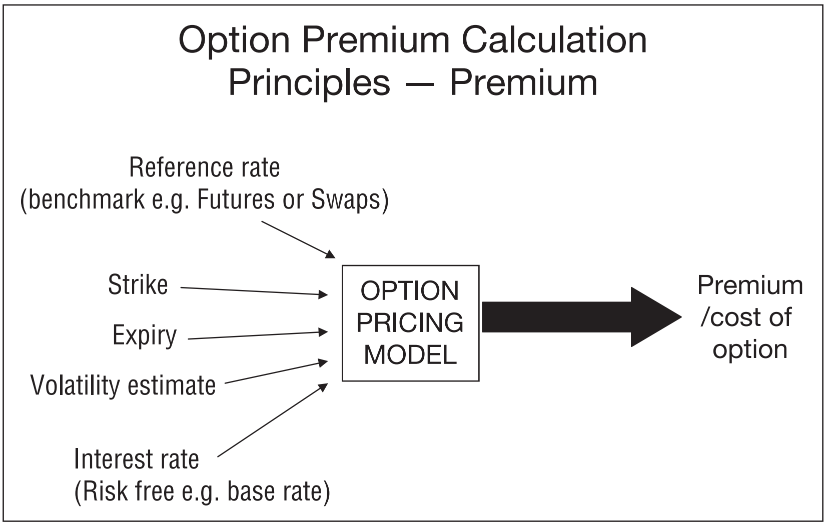


FIGURE 6.1 Principles of premium calculation: Premium

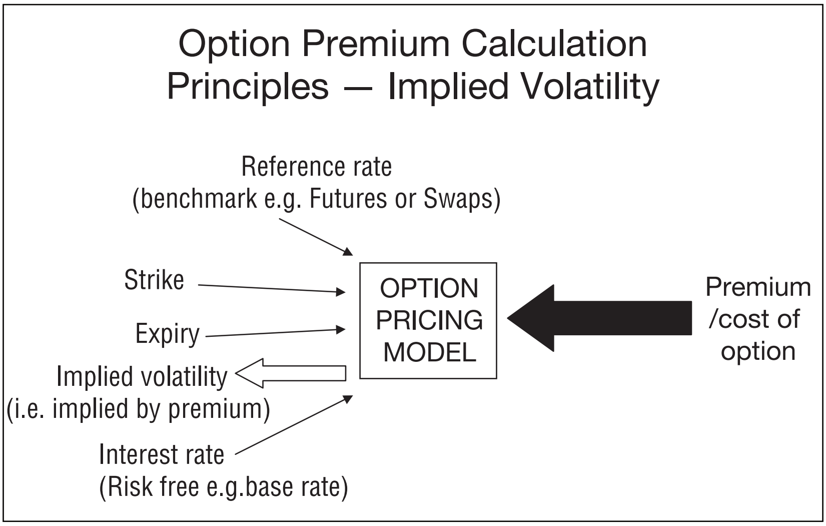


FIGURE 6.2 Principles of premium calculation: Implied volatility

TYPES OF OPTIONS

- **In futures markets**

Calls — the right, but not the obligation, to buy the underlying futures contract at the strike price.

Puts — the right, but not the obligation, to sell the underlying futures contract at the strike price.

- **In swaps markets**

Caps — OTC-market equivalent to "calls" in the futures market.

Floors — OTC-market equivalent to "puts" in the futures market.

OPTION STRATEGIES FOR HEDGING ENERGY-PRICE EXPOSURE

Simple option strategies for hedging against market price movements are summarized in Table 6.1.

Table 6.1 Option hedging strategies

To hedge a "short" energy exposure with options	To hedge a "long" energy exposure with options
Buy call or cap	Sell call or cap
Sell put or cap	Buy put or cap
Buy call spread	Sell call spread
Sell put spread	Buy put spread

The financial exposure and/or protection received when using options compared to swaps/futures contracts is summarized in Table 6.2:

Table 6.2 Summary of exposures: options vs. swaps/futures

Position	Risk	Reward
Long Call	Limited to premium	Unlimited
Long Put	Limited to premium	Almost unlimited*
Short (written) Cap/Floor (Call/Put)	Unlimited (if option position is not hedged)	Cash premium Received
Long (Purchased) Underlying swap/future	Almost unlimited*	Unlimited
Short (sold) Underlying swap/future	Unlimited	Almost unlimited*

*since asset value and or derivative contract value cannot fall below 0

The flexibility of options really starts to become clear when we look at combinations of the above strategies of buying some calls/caps and selling some puts/floors at different tenures, at different strike prices and for differing volumes. The variety of combination structures that can be created using options is endless; the possibilities are limited only by our own creativity and the complexity of the exposure that needs to be protected against (or, in the case of an investor/trader, an exposure to which they wish to become exposed). However, there are some quite-regularly applied structures in the energy derivatives markets which can be discussed here as a base from which traders/hedgers can work.

• The Greeks

In the rest of this chapter, we will look at strategies that can give investors or traders exposure to or protection from changes in market price risk and in market volatility.

Before this, however, we need to look more closely at what could be described as the atomic structure of options: the components or forces in action in an option's price and also how it reacts to changes in the underlying energy market against which it is valued/priced. These components are commonly known as the "Greeks" and comprise Delta, Gamma, Theta and Vega.

Delta: shows how much the option's price changes when there is a change in the underlying asset price. It is closely related, but not equal, to the probability that the option will be exercised. From a risk-management perspective, the delta of an option is important for creating a risk-neutral portfolio; that is, you are trying to hedge the underlying cash commodity or futures or swap using options.

Gamma: measures the rate at which delta changes. Some options have very high gamma, which means that a small change in the underlying asset's price can lead to a significant change in delta.

Gamma can be a major headache for risk managers because they must "delta hedge" their portfolio on a regular basis; that is, they must constantly monitor the delta change arising from a high gamma situation to make sure they are not under-hedged via options.

Gamma is at its highest when the option is at-the-money and reduces as the energy price goes up or down, pushing the option either in-the-money or out-of-the money.

Risk managers should be aware that the writer (seller) of an option is always "negative gamma", whether the option is a call or a put. The holder or buyer of an option is therefore "positive gamma". For traders who are negative gamma, the only way to reduce this gamma exposure is to go long on other options. Negative gamma is dangerous because an adverse movement in the underlying can lead to a substantial loss, while a favorable (profitable) move leads to only a minor profit.

Theta: measures the time decay in an option. A person who is long on an option (bought, buyer), whether a call (cap) or put (floor), suffers from time decay because as the option approaches maturity its value gets closer to its intrinsic value.

There is a relationship between theta and gamma: when gamma is high, theta is also high, which means that the option loses value more quickly as it approaches maturity, its expiry date.

From a risk perspective, an option with high theta could be good news for a counterpart who is short (has sold already) and bad news for the trader who is long (who has already bought). However, along with high theta is high gamma, and the counterpart who has sold the high-theta option is effectively holding a "risky" option.

The general understanding is that if you sell an option, time is in your favor, as you profit from time decay.

Remember, though, that "theta pays for gamma". While you may benefit from theta, you are suffering from high gamma. You can't have it both ways.

Vega: measures the sensitivity of an option to a change in volatility of the underlying asset.

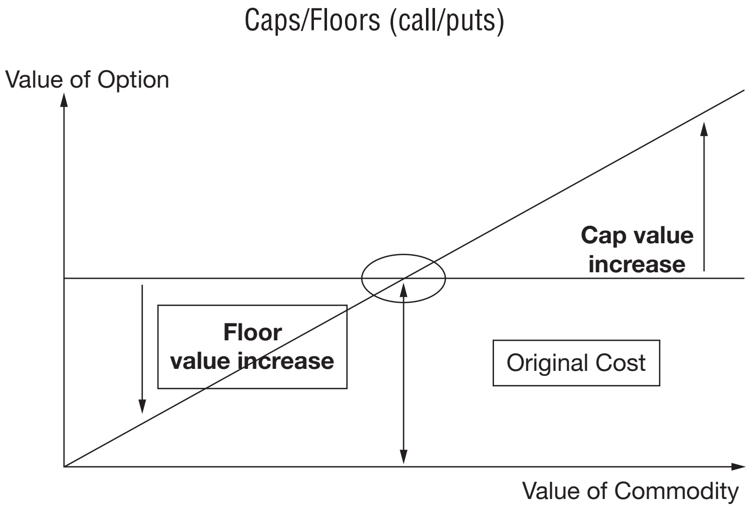
Delta, however, tells you the sensitivity of the option's price to a change in the underlying asset/swap. For example, traders who are very certain that volatility in the market is going to increase would try to build their portfolios so that they had very high vega.

As with theta, the option is most sensitive when it is at-the-money. Vega is positive when you are long calls and puts. An increase in the volume makes the option more valuable.

Vega calculations are important for volatility trading (strategies will be discussed later in this chapter). If you feel the implied volatility is too high, you could sell both a call and a put and buy them back later, at a cheaper price, when the volatility calms down.

OPTION STRATEGIES

Figure 6.3 illustrates how the value of caps in the OTC market (and calls in futures markets) and floors in the OTC market (puts in the futures market) move compared to the overall value of the energy commodity they are valued against.



Source: Energy College Ltd, London, www.energycollege.org

FIGURE 6.3 The movement of caps/floors

For a fixed premium, a buyer of a cap (call) is protected on the market price becoming stronger, while a buyer of a floor (put) is protected on the market price becoming weaker.

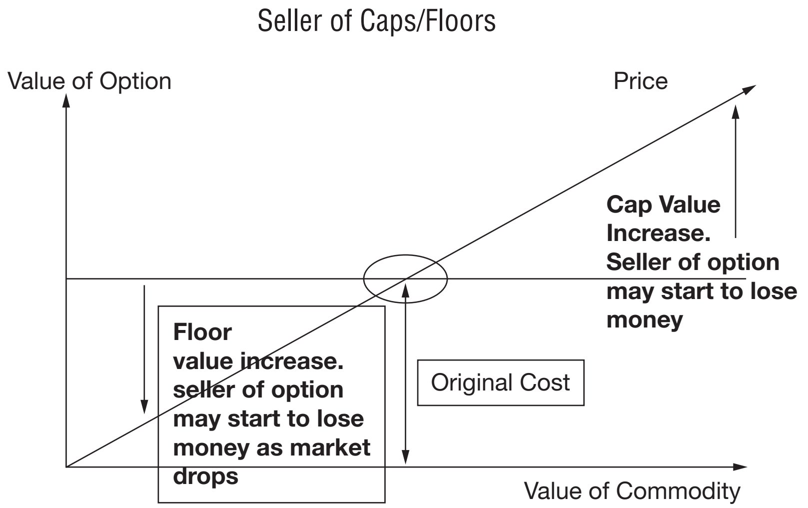


FIGURE 6.4 Selling caps/floors

A seller of a cap (call) receives a fixed premium (cash) for selling the option, and this is what makes derivatives useful in finance deals. However, there is exposure if the average market price during the life of the option goes above the fixed cap price/strike price.

A seller of a floor (put) receives a fixed premium (cash) for selling the option but there is exposure if the average market price during the life of the option goes below the fixed floor price/strike price.

Table 6.3 Hedging short energy positions with options

	Anticipations	Characteristics
Short call	Implied volatility down	Limited profit — Unlimited loss — Limited protection — Cash credit — Risk profile at expiry equivalent to a short put
Long put	Implied volatility up	Unlimited profit — Limited loss — Unlimited protection — Important cost — Risk profile at expiry equivalent to a long call
Short call spread or bull spread	Implied volatility direction depends on the strikes: Sell call and buy call with higher strike If a rise in implied volatility is expected: buy ATM call/sell ITM call, equal volumes If a fall in implied volatility is expected: buy OTM call/sell ATM call, equal volumes	Unlimited profit — Unlimited loss — Limited protection — Low cost — Risk profile at expiry equivalent to a long semi-futures
Long put spread or bear spread	Implied volatility direction depends on the strikes: Sell put and buy put with higher strike If a rise in implied volatility is expected: buy ATM put/sell OTM put equal volumes on both options If a fall in implied volatility is expected: buy ITM put/sell ATM put, equal volumes again	Unlimited profit — Unlimited loss — Limited protection — Low cost — Risk profile at expiry equivalent to a long semi-futures

Table 6.4 To hedge long underlying position with options

	Anticipations	Characteristics
Short call	Implied volatility down	Limited profit — Unlimited loss — Limited protection — Cash credit — Risk profile at expiry equivalent to a short put
Long put	Implied volatility up	Unlimited profit — Limited loss — Unlimited protection — Important cost — Risk profile at expiry equivalent to a long call
Short semi-futures	Implied volatility direction depends on the strikes: Buy put and sell call with a higher strike If a rise in implied volatility is expected: sell OTM call/buy ATM put, equal volumes If a fall in implied volatility is expected: sell ATM call/buy OTM put, equal volumes	Limited profit — Limited loss — Unlimited protection — Low cost — Risk profile at expiry equivalent to a long fence or a bull spread
Short call spread or bull spread	Implied volatility direction depends on the strikes: Sell call and buy call with higher strike If a rise in implied volatility is expected: buy ATM call/sell ITM call, equal volumes If a fall in implied volatility is expected: buy OTM call/sell ATM call, equal volumes	Unlimited profit — Unlimited loss — Limited protection — Low cost — Risk profile at expiration equivalent to a long semi-futures
Long put spread or bear spread	Implied volatility direction depends on the strikes: Sell put and buy put with higher strike If a rise in implied volatility is expected: buy ATM put/sell OTM put, equal volumes If a fall in implied volatility is expected: buy ITM put/sell ATM put, equal volumes	Unlimited profit — Unlimited loss — Limited protection — Low cost — Risk profile at expiry equivalent to a long semi-futures

OTC OPTIONS AND POPULAR STRUCTURES

The option products that are most frequently used in the oil market are caps, floors and collars, and the most commonly traded OTC options are Asian options. These do not exercise into any other contract; they simply provide cash-settlement against the underlying price reference (unlike futures options, which end up expiring into a futures contract which has to be traded out of).

The next-most popular kind of option is a "swaption", which can be either American-style or European-style. This exercises into a swaps contract, buy or sell, at the strike price selected.

• Asian options

The profit from an Asian option depends on the price history of the underlying commodity that is being used as the price reference, over all or part of the life of the option.

The Black-Scholes formula cannot be used for pricing an Asian option because this is an average-price option, an average of prices are not log-normally distributed. The alternative is the Monte Carlo approach (see Chapter 7 for more details). The option strategy pays the buyer of the collar (that is, the buyer of the cap, the seller of the floor) if the market rises. However, if the market falls below the floor, the exposure is open. An oil consumer who buys a collar is protected from adverse upward move but pays nothing for it. But the oil consumer does not necessarily give away all of the benefit of lower prices.

• Barrier options

Barrier options were invented to reduce the initial cost of hedging through the buying of options. The barrier option either comes to life (is knocked in) or is extinguished (knocked out) under certain conditions. In practice, the event which activates or kills the option is defined in terms of a price level (barrier).

The barrier option may be combined with a rebate: for knock-out options, the rebate is paid as compensation to the holder when the option is cancelled. A typical example of a barrier option is the "up-and-out floor" (put).

Table 6.5 Barrier options

		Out	In
PRICE	Up	Up-and-Out	Up-and-In
	Down	Down-and-Out	Down-and-In

All the combinations linked to a cap or floor illustrated in Table 6.5 are available in the OTC market.

Up-and-out floor: This is typically purchased by energy producers who want to hedge their natural long position in the markets. An "up-and-out floor" (put) may be an attractive alternative to the normal floor/put option, as it is less expensive and provides the same price protection if prices move down from current quoted levels for futures/swaps. However, if prices move upwards, the increase in the underlying commodity's price reduces the need for downside risk protection at the original strike price. If the price moves up sufficiently to cross the selected "barrier" price, the "knock-out", then the option is cancelled or extinguished: it is "knocked-out". The hedger may then consider re-entering the market with a new hedge by buying another floor but at a higher strike price.

The up-and-out barrier is less expensive that a standard Asian, European or American option because the underlying price may fall below the strike price after initially rising, hitting the barrier and canceling the option.

Crack and spread options: Some banks and traders or market makers will even quote options on differentials such as the refinery margin; that is, crude oil price versus the price of refined oil products. This is particularly useful when having to deal with negative system margins. An organization operating a refinery cannot choose to stop producing some petroleum product. A crack option offers protection against the margin becoming worse, but at the same time allows the refinery or speculator to benefit from an improvement in the margin. By contrast, using swaps or futures to lock in the negative margin does not allow appreciation from an improvement in the margin. This applies to petrochemical and power-production margins such as spark-spread options.

It is even possible to create a zero-cost collar spark-spread option, or refinery option, where the margin option can be sold at one level to buy protection against the margin at another, giving protection from the margin going below the floor-price margin option and locking in the margin at the strike price sold on the cap-margin option.

Other spread or arbitrage options seen in the market from time to time include crude against crude i.e. Nymex WTI Crude versus ICE Brent Crude futures, the complete refinery margin options; and individual cracks between crudes and petroleum products such as gasoil, jet fuel and fuel oil. There are also spark-spread options; that is, natural gas against power prices, or gasoil or fuel oil against power prices.

- **Delayed start-date options**

As well as the knock-in and knock-out option into the caps and floors used for trading or price-risk management, it is now also possible to obtain a delayed start date from traders and market makers. One example of the application for this can be found in the chapter on hedging examples/scenarios. If an organization were trying to hedge the production of a new refinery, oil field, petrochemical plant or utility power station, it is quite possible that it would have an approximate start date for production or completion. It may well be, though, that some delay may occur before that date. The nightmare scenario for hedgers or risk managers is to be stuck with a hedge for an asset/energy which does not eventuate or is not ready at the designated time. When this happens, the hedge immediately becomes a speculative position for accounting purposes and is an unwanted, unprotected risk in its own right. This could certainly undermine a company's cash-flow forecasts.

To reduce this risk, it is possible (at a price) to have delayed start-dates built into option structures and sometimes this option can be embedded into a swaps hedge structure as well. This usually means that at a certain date, perhaps three months before the derivatives hedge start-date, the user of the hedge can nominate on a particular day or any day up to a certain cut-off point to delay the start of the hedge. The delayed start-date would normally be fixed, or it might be possible to delay the hedge to another specified date, or to delay it by a certain number of days.

OPTIONS TRADING — VOLATILITY TRADING

Options can be used to trade the market price; in other words, they can be used to benefit from movements in the underlying swaps or futures market. But, for investment trading purposes, options can also be used to benefit from the market going nowhere.

At the beginning of this chapter we talked about implied volatility. This is an important component in the cost or value of an option. By using special combinations of calls and puts, or caps and floors for OTC markets, it is possible to make a trade based on whether you, as a trader, think volatility will increase or decrease. This is done by what is known as volatility trading and involves setting up a delta-neutral portfolio (delta neutral = market-price neutral).

• Volatility strategies

A trader who wants to take advantage of the underlying volatility of the market increasing or decreasing can use the following option strategies:

Straddles: Sell call (cap) and sell put (floor) at the same strike price in the same market. It is important to appreciate that although a short straddle is delta neutral (+/– balanced), it is not gamma neutral.

Strangles: These are essentially the same as straddles except that traders will use out-of-the money options and different "strike" prices. If a trader thinks the volume is going down, he would normally short (sell) these options, while if he thinks the volume is going up, he would go long (buy) them.

Volatility Strategies

Your view:	Volatility is going to increase
Options:	Buy (long) a straddle or strangle. A long straddle involves buying the put (floor) and the call (cap) at the same strike price.
	Short (sell) butterfly strategy (see below)

Your view:	Volatility is going to decrease
Options:	Short (sell) straddle or strangle. A short straddle involves selling (writing) the put (floor) and the call (cap) at the same strike price. Long (buy) butterfly strategy (see below)

BUTTERFLY STRATEGY

The only issue with using straddles and strangles is the potentially unlimited loss on the strategy. This can be managed but it must be actively hedged and monitored. However, because of this risk concern there are other trading strategies which have less upfront risk.

The butterfly is an option strategy that has both limited risk and restricted profit potential. It is created by using four strike prices. The strategy may be set up using caps or floor options, as shown in Figure 6.5.

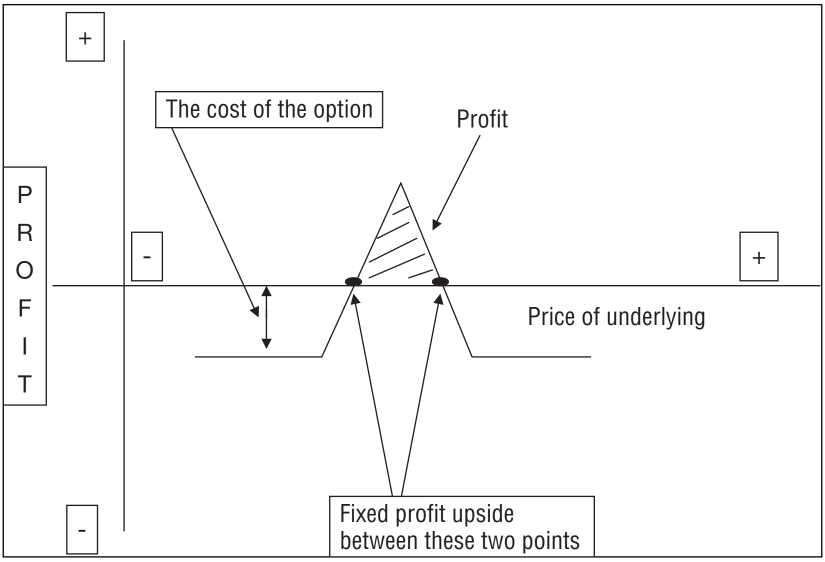


FIGURE 6.5 The profit/loss profile of a butterfly option strategy

A short/long butterfly strategy allows the trading of volatility and has an advantage over a straddle and even less risk than a strangle because the structure creates a fixed cap on maximum loss. This is already built into the strategy, so active position-management requirements are reduced.

With a long (buy) butterfly (illustrated in Table 6.6), option premiums are paid and it offers limited risk. This is used when the view is that volatility is going to decrease.

Table 6.6 Example of a long (buy) butterfly

	Buy 1x Call	Sell 2x Call	Buy 1x Call
Strike	US$20	US$22	US$24

A short (sell) butterfly (illustrated in Table 6.7) has limited risk and receives more premium then premia paid out. It is used when the view is that volatility is going to increase.

Table 6.7 Example of a short (sell) butterfly

	Sell 1x Call	Buy 2x Call	Sell 1x Call
Strike	US$20	US$22	US$24

RATIO BACKSPREADS

It is also possible to trade both the market price and volatility at the same time by using special options structures called "ratio backspreads". A backspread is a delta-neutral spread which is achieved by buying options with smaller deltas and selling options with large deltas. It will also consist of more long (bought) options than short (sold) options, with all options expiring at the same time.

- A ratio-call backspread consists of buying calls at a higher strike price than the strike price of call options sold.
- A ratio-put backspread consists of buying puts (floors) at a lower strike price than the strike price of the puts (floors) sold.

Typically a trader will execute a backspread for some positive cash flow (that is, some credit premium in his favor) since the amount of option premium received for the sold options is greater that the premium paid for the options bought in the strategy.

In **a call (cap) backspread strategy** (which is a directionally bullish strategy) as illustrated in Figure 6.6, if the energy-market price collapses, then all the options in the strategy will most probably expire with zero value. In a put (floor) backspread strategy (which is a directionally bearish strategy), if the energy-market price rises by an extreme measure, then all the options in the strategy will most probably expire with zero value.

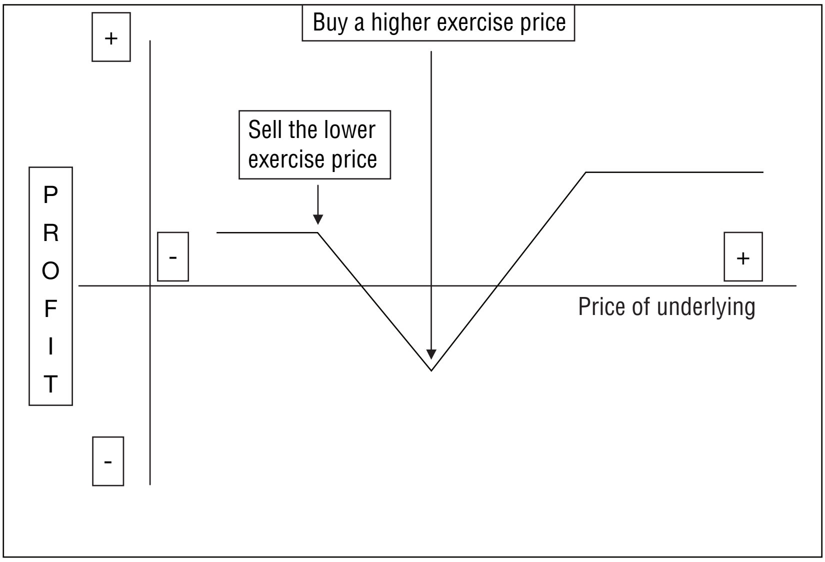


FIGURE 6.6 Call-backspread option strategy

Traders would choose the type of backspread, either a cap or floor, which reflected their price direction expectations.

In a call backspread, the profit potential is unlimited if the market price of the underlying energy market moves higher. The key to a backspread is that some price movement will happen during the lifetime of the strategy. If the market price does not really move much, any backspread strategy is more than likely to end up being a losing strategy.

Strike prices in a crude-oil call-backspread option strategy might resemble those shown in Table 6.8.

Table 6.8 Example of strike prices in a crude-oil call-backspread option

Long 600 December US$25 Strike Calls @ 24 cents Short 200 December US$20 Strike Calls @ 78 cents
Long 400 March US$27 Strike Calls @ 23 cents Short 200 March US$22.50 Strike Calls @ 51 cents
Long 600 December US$20 Strike Calls @ 20 cents Short 200 December US$25 Strike Calls @ 120 cents
Long 400 March US$22.50 Strike Calls @ 150 cents Short 200 March US$25.00 Strike Calls @ 249 cents

In **a put backspread strategy** the profit potential is unlimited if the market price falls. Again it should be noted that if the market price does not really move much, any backspread strategy is more than likely to lose.

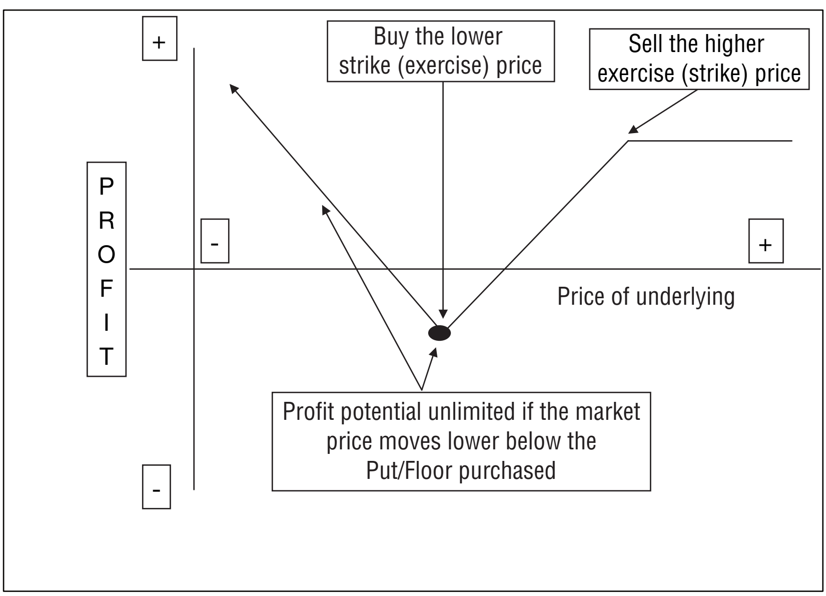


FIGURE 6.7 Put-backspread option strategy

Strike prices in a crude-oil put-backspread option strategy might resemble those shown in Table 6.9.

Table 6.9 Example of strike prices in a crude-oil put-backspread option

Long 600 December US$20 Strike Calls @ 20 cents
Short 200 December US$25 Strike Calls @ 120 cents
Long 400 March US$22.50 Strike Calls @ 150 cents
Short 200 March US$25.00 Strike Calls @ 249 cents

Table 6.10 Recap on option trades against market implied volatility

	Result of a large mkt price swing in the underlying swaps or futures contract	Increase in Implied Volatility	Decrease in Implied Volatility	Time Value Effect
Ratio Call Backspread	beneficial	beneficial	not beneficial	not beneficial
Ratio Put Backspread	beneficial	beneficial	not beneficial	not beneficial
Long straddle	beneficial	beneficial	not beneficial	not beneficial
Short straddle	not beneficial	not beneficial	beneficial	beneficial
Long Strangle	beneficial	beneficial	not beneficial	not beneficial
Short Strangle	not beneficial	not beneficial	beneficial	beneficial
Long Butterfly	not beneficial	not beneficial	beneficial	beneficial
Short Butterfly	beneficial	beneficial	not beneficial	not beneficial

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CHAPTER 7

Energy Option-pricing Models

Modern option-pricing techniques are considered to be among the most mathematically complex of all applied areas of finance, although these modern techniques have their origins in work that dates back to 1877. At that time, Charles Castelli wrote a book entitled *The Theory of Options in Stocks and Shares*, which introduced the general public to the hedging and speculation aspects of options, but lacked any usable theoretical base.

The financial markets really had to wait until the work of Fischer Black and Myron Scholes was published in 1973 for anything that was very practical for options valuations. That was when they introduced their landmark option-pricing model: Black-Scholes, perhaps the most famous of all option models.

ENERGY-MARKET OPTIONS

The most popular options in the energy futures markets such as IPE and NYMEX are all American-style options. However, in the OTC markets, Asian options (path-dependent options) are the most popular. The distinction between American, European and Asian-style options is an important one, because of the models that are needed to value them. For the purposes of this book, the Black-Scholes model cannot be applied to bottom-line Asian options because they are whole-month average options and the distribution of arithmetic averages of a set of log-normal distributions do not have analytically tractable properties.

GENERAL RULES FOR OPTION VALUES

Table 7.1 Cost comparison of various options

In order of expected cost		
	American-style options	← Most expensive
	European-style options	
Cheapest →	Asian-style options	

- **American-style options**

The minimum value for a call (cap) is zero and the maximum is the difference between the underlying energy futures or swap-market price and the strike price (exercise price) of the option, whichever is the greater. The option value cannot be a negative value.

The minimum value for a put (floor) is zero and the maximum is the difference between the underlying energy futures or swap-market price and the strike price (exercise price) of the option, whichever is the greater. The option value cannot be a negative value.

The maximum value for a put (floor) is its strike price. The underlying futures/swap cannot become negative in value so the biggest profit on a put (floor) is the difference between its strike price (exercise price) and zero.

The value of a call (cap) option with a longer time value/validity time until expiry must be at least the same as that of a corresponding shorter-dated American-style call. For example, if you take quotes for at-the-money call (cap) for the month of December and the at-the-money call (cap) for the month of January, the January at-the-money call (cap) should be worth more than December because of an extra month's time value in the option.

American-style call (cap) options should sell for at least the same price as a European-style call option, and will normally cost more than European-style options. This is because American-style options give the buyer the right to trigger/exercise the option into its underlying futures/swaps contract at any time during the lifetime of the option. European-style options give much less flexibility, by only allowing the option to be exercised at a single point in time, usually the expiry date of the option.

- **European-style options**

The minimum value for a call (cap) is zero and the maximum is the difference between the underlying energy futures or swap-market price and the strike price (exercise price) of the option, whichever is the greater. The option value cannot be a negative value.

The minimum value for a put (floor) is zero and the maximum is the difference between the underlying energy futures or swap-market price and the strike price (exercise price) of the option, whichever is the greater. The option value cannot be a negative value.

The maximum value for a put (floor) is its strike price. The underlying futures/swap cannot become negative in value, so the biggest profit on a put (floor) is the difference between its strike price (exercise price) and zero.

- **Asian options**

The majority of OTC energy-option transactions is made up of Asian-style caps, floors and zero-cost collars. Asian options are a type of path-dependent option, sometimes referred to as a "look-back" option, where the buyer has the right to exercise the option at the average price of the underlying energy market over the period of the option. Asian options are cheaper than ordinary European-style options because the volatility of an average is lower that the volatility surrounding just one point in time, as is the case for a European-style option. In the energy markets we usually deal with quite long averages and, like swaps, Asian options tend to cover whole-month averages (20 pricing days approximately).

Table 7.2 Effect of market changes on an option's value

	Cap Value (call)	Floor Value (put)
The price of the energy futures/ swap rises	Increases	Decreases
The price of the energy futures/ swap drops	Decreases	Increases
Volatility Increases	Increases	Increases
Volatility Decreases	Decreases	Decreases
Time Decay Effect	Decreases	Decreases

There is an online option calculator at the following website: www.optionvueresearch.com/webtools2/FairMarketValueCalculator.asp

For more on the mathematics and developments in financial modeling, visit University of Oxford Mathematical Institute at: www.maths.ox.ac.uk

There is also some interesting new development work in various risk-management modeling, including energy-sector work, by Professor Robert Jarrow at: www.kamakuraco.com

MODELS USED IN THE ENERGY INDUSTRY

All traded options on the energy markets of the New York Mercantile Exchange and the International Petroleum Exchange are American-style options. The models that can be applied to these are a combination of the Barone-Adesi and Whaley model, and the famous Black-Scholes model.

Black-Scholes is perhaps the most famous model because it is a simple solution to what can be a complicated problem. The model requires a limited number of data inputs and requires relatively simple mathematical calculations. Although the Black-Scholes model was originally developed with European options in mind (an analytical option-pricing formula which is used to price European options on non-dividend asset), it can be extended to price American options as well.

Option calculators will often use the Barone-Adesi and Whaley method. This method prices an American option by valuing the corresponding European option using the Black-Scholes method and then adds on an early-exercise premium (since, unlike European-style options, an American-style option can be exercised on any day and at any time up to and including its expiry date if the underlying price exceeds some market-price level calculated by the model). However, this model cannot be applied to Asian options.

ASIAN OPTION PRICING

Monte Carlo simulation is a mathematical technique for calculating derivative values which can be only predicted statistically. The name is derived from the analogy of generating a sequence of random numbers as if from the roulette wheel at the casino in Monte Carlo, where the result arrives by chance.

Monte Carlo simulation is the tool to use for Asian options because when an Asian option is defined in terms of arithmetic averages of the underlying energy price over a one-month period (which is in 99% of cases in energy markets), no Black-Scholes or analytical pricing formula is going to be of any use. Monte Carlo simulation is a simulation of many possible paths the underlying energy price may take. The estimate of value of the option in this case is the average of the expected gain/profit, discounted from the end of the life of the option to the beginning, using the risk-free interest rate.

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CHAPTER 8

Value-at-Risk and Stress Testing

It is well understood within the industry that it is not the size of the position but the capital at risk that really matters.

When an organization embarks on trading or hedging in the energy markets, it is important that a methodology for measuring market risk is adopted. One of the key concepts of risk measurement in the energy sector is the probability-based risk-measurement method known as value-at-risk (VaR). The results produced by a VaR model (and there are different types of VaR) can be easily understood and appreciated by all levels of staff from all areas of an organization, which is why VaR has been adopted so rapidly across many industries.

A RISK-MANAGEMENT SCENARIO

A risk manager at ABC Trader Ltd is responsible for managing the company's natural-gas positions. The Board of Directors calls this person in for a meeting, after hearing about derivatives losses suffered by other companies in the natural-gas market. The Directors want to know if the same thing could happen to their company. That is, they want to know just how much market risk the company is taking. How should the risk manager reply?

The risk manager could start by listing out and describing the company's natural-gas derivatives positions, but this isn't likely to be helpful and does not answer the Board's real question: "How much market risk is the company taking?"

The risk manager is in a tricky position. Listing the company's positions only helps if the Directors actually understand all of the positions and all the derivative instruments and the risks inherent in each. Of course, all management guidelines point out that the Board should be involved in approving risk-management policies and should have a broad general understanding of derivatives. The reality is, though, that Board members are not involved in the day-to-day risk-management and trading functions and so will probably not be able to appreciate these details however well they are explained.

The risk manager could perhaps talk about the portfolio's sensitivities. He could explain how much the value of the portfolio changes when various underlying market rates or prices change, and perhaps talk about option deltas and gammas. But even if he is confident in his ability to explain these in plain language, this does not clearly quantify what risk the company is taking in the natural-gas market.

The risk manager could make the bold statement (if true) that the organization, in line with its risk-management policy, never speculates but, rather, uses derivatives only to hedge. This would mean that there could be a loss of opportunity but there would be no massive risk of uncovered losses as a result of speculation gone wrong. But the Board by this stage might ask again, "How much is the company at risk in the natural-gas market? Are our hedges effective?"

Perhaps the best answer would start with: "The value at risk of our natural-gas positions is X million dollars." This is the kind of answer that the VaR method is designed to supply. Value-at-risk is a mathematical approach to modeling financial risk in a derivatives portfolio. Put simply, it poses the question: "How much money could an organization lose over a given period of time on its trading portfolio?"

VAR AND OTHER RISK-MEASUREMENT METHODS

VaR was conceived in 1993, partly in response to various financial disasters. Work started on its development in 1988 after central banks wanted a methodology to set minimum capital requirements to protect against credit risk in trading. Banks began to adopt VaR in the period 1993–95 and, in recent years, non-bank energy traders and end-users have also begun to use it. Now the majority of major oil companies and traders are using the VaR method for risk measurement.

When using VaR in the energy markets, it should be remembered that any valuation model is simply a representation of a possible reality or a possible outcome, based on certain probability and confidence percentage parameters. It is all too easy to experience a false sense of security when using VaR and to believe that its valuations represent the limit of what an organization could lose in a 24-hour period.

For this reason, some stress testing of derivative portfolios should be used alongside VaR. For example, a company could periodically take its trading position and test the result of a three standard deviation move in energy-market prices, as well as changes in market prices and volatility (if the company has option positions). Value-at-risk, like any risk-measurement tool, is not sufficient on its own, and an organization should have a number of tools as part of its risk-management policy.

Figure 8.1 shows some of the main measurement techniques available to complement VaR. The use of stress tests and sensitivity analysis alongside VaR will be examined later in this chapter.

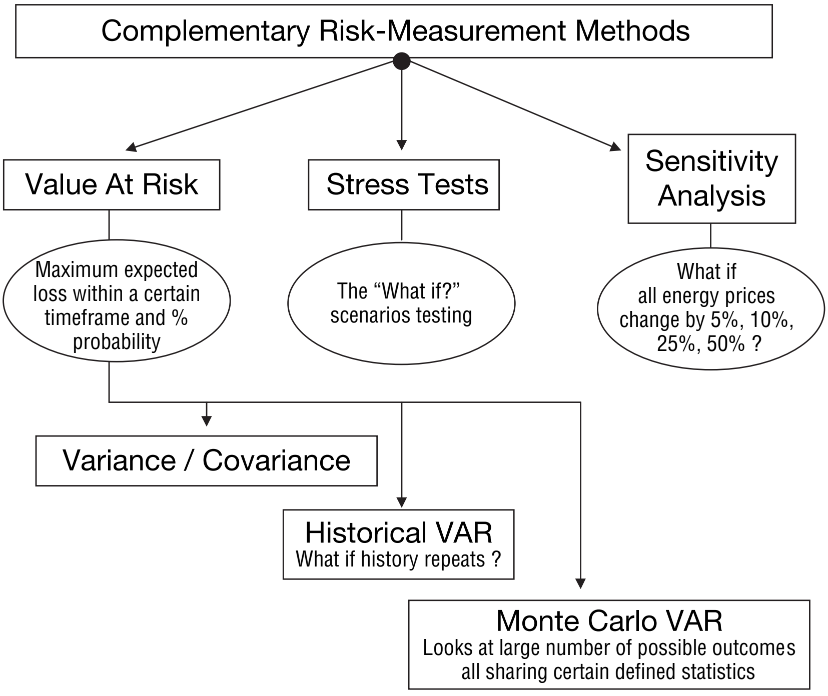

FIGURE 8.1 Complementary risk-measurement methods

Before VaR was developed, trading companies only had recourse to "add-on" approaches to risk measurement, in which they would set an in-house margin rate (capital charge) for derivative trades. The percentage was based on a percentage of notional value and would vary depending on the tenure of the derivatives deal. For example, the add-on rule could be that when a deal was in the tenure range of one-to-six months forward, a value of 10% was taken of the notional value as the add-on risk. So, for a deal involving 50,000 barrels of jet fuel at US$25 per barrel, the notional value would be US$1.25 million, which would mean that 10% of that figure (US$125,000) would be booked to be used by the company's trader on this derivative position. Then, in addition to this, every day any unrealized loss would be added to the position and the add-on value would be revalued based on the most current fair value of the derivative.

The problem with this approach is that, as Bank of International Settlement research has indicated, add-on methodologies can create situations in which too much capital is being used on a risk, and sometimes not enough capital is being allocated to reflect the risk being taken as a trader. For this reason, companies still using such a methodology should seriously review their position.

WHAT DOES VAR DO?

There are different types of VaR models which will be examined in this chapter from a practical application standpoint, but, basically, VaR measures the worst expected loss over a given time horizon with a certain confidence — or probability — level.

VaR allows management to see the probable risk their company is taking, or, in the case of companies hedging, it can also illustrate reduction in possible financial exposure. VaR has great appeal since it can summarize all the market risks of the company's entire portfolio (oil, gas, power, coal, forex…) across physical and derivatives positions and represent that as one number in U.S.-dollar terms.

The key use of VaR is for assessing market risk (exposure to losses in the market place through physical and derivative positions), although VaR is being used more frequently to assess credit risk (credit VaR modeling). However, value-at-risk does not give a consistent method for measuring risk, as different VaR models will come up with different results. It should also be noted that VaR only measures quantifiable risks; it cannot measure risks such as liquidity risk, political risk or regulatory risk. In times of great volatility, such as war, it may also not be reliable. For this reason, VaR models should always be used alongside "stress testing", as mentioned earlier.

Nick Leeson and the collapse of Barings

In February 1995 the world was shocked by the news that the U.K.'s oldest bank, Barings, had collapsed. Investigations revealed that its downfall was largely due to the activities of one of its young investment officers, Nick Leeson.

Leeson worked in the bank's Singapore office and traded on the Singapore Monetary Exchange (SIMEX). His risky and unauthorized derivatives investments in the Japanese futures market resulted in losses of around US$1.3 billion. This huge loss wiped out the firm's entire equity capital and led inevitably to the bank's collapse.

Putting aside the lack of properly enforced risk-management policies for a moment (these will be discussed in Chapter 10 on Management Controls), it is interesting to note that under normal market conditions the potential loss of Leeson's trading positions would have exceeded US$835 million, five per cent of the time. If these VaR calculations had been in place, the parent company, Barings Bank in London, may have been able to provide some protection against the disaster that was awaiting them.

To calculate VaR, a mathematical model needs to be chosen and, in some cases, historical price data on the relevant markets should be obtained. Then, a time horizon should be selected (for example, overnight) and a probability (or confidence) factor should be chosen. Most VaR models use a time horizon of one day (sometimes referred to as the "holding period") and, in the energy industry, the most common confidence level is around 95%, (although more-conservative companies often prefer a higher figure). A 95% confidence level means that the company is expecting this value-at-risk loss to be exceeded, on average, one day in every 20. The confidence level should, of course, be reviewed and approved at a Board level in the organization when the organization's risk-management policy is presented for approval.

There are several types of VaR and some are better than others in their practical applications. The three most important types are:

Variance/covariance VaR: This is generally the most popular method amongst energy-market participants.

The historical method: In essence, this method asks "What if history repeats itself?"

Monte Carlo VaR simulation: This method looks at a large number of possible outcomes all sharing certain defined statistics and is also known as "stochastic simulation".

- **Variance/covariance VaR**

This approach was pioneered by RiskMetrics (originally part of JP Morgan) and a selection of its products can still be found on the Internet at www.riskmetrics.com. It involves using information on the volatility and the correlation between the various markets in which an organization is holding derivative and physical positions. VaR takes into account the price-correlation relationships between the various parts of an organization's energy derivatives/physical portfolio. One would expect that a buy and a sell even in two different energy markets which were highly correlated with one another would produce a low VaR. However, if an organization held a long (buy) position in coffee beans and a short (sell) in North Sea Brent crude oil, one would expect that these would not have much of a price-correlation relationship and the VaR would be much higher, as there would be no offsetting between the long and the short positions within the organization's portfolio.

Variance/covariance models are fairly easy and quick to compute and calculate, as they can be produced on a spreadsheet, and they are useful for the intra-day management of simple futures/swaps portfolios. However, they are not suitable for complex portfolios of derivatives. An analysis of options contracts, for example, will often produce erroneous results under this model. Monte Carlo VaR is the only methodology that can produce precise VaR results for more complex derivatives portfolios that include options.

Strength: Easily calculated in markets which have readily available market data

Weakness: Historic correlations and volatility relationship may break down under extreme market conditions.

Requirement: VaR calculator.

- **Historical simulation VaR method**

The historical VaR method is simple to understand and uses real historical data from the markets in which an organization is active. If the data is available, it is possible to use this method to run a historical

VaR on a trading portfolio as if it were going through, say, the Gulf War of the early nineties.

The method works by running the position of the organization's current portfolio against historical market movements to create a P+L scenario. For example, if that portfolio consists of 30% natural gas, 50% Singapore fuel oil and 20% U.K. API 2 coal, it should obtain the historical market data for the three components for the last 720 data items (720 market/business days = approx three years). Then for each day over that 720 historical period the value of the current portfolio can be calculated.

The drawback of this approach is that it is very time-consuming and can be very demanding on computer resources if the portfolio is complex or if it is run over many years of historical data.

Strengths: As well as being simple, the historical VaR approach is more realistic than the variance/covariance approach since the volatilities and correlations in this approach are not actual figures, but simply estimates based on averages over a specified time. It does not require mapping, unlike variance/covariance. Mapping is the sometimes painful process of trying to fit a derivatives position into the volatility statistics which are available.

Weaknesses: It is time-consuming and requires considerable computer resources. It is also reliant on history repeating itself.

- **Monte Carlo VaR simulation (Stochastic Process)**

The Monte Carlo simulation methodology can be used to handle complex derivative portfolios including OTC/exotic options and it has a number of similarities to the historical simulation model. The key difference is that the historical simulation model carries out the simulation using the real observed changes in the market place over the last X periods (using historical market-price data) to generate Y hypothetical portfolio profits or losses, whereas in the Monte Carlo simulation a random number generator is used to produce tens of thousands of hypothetical changes in the market. Many energy-market participants will use a minimum of 30,000 calculations in this process. These are then used to construct thousands of hypothetical profits and losses on the current portfolio, and the subsequent distribution of possible portfolio profit or loss. Finally, the VaR is determined from this distribution according to the parameters set (for example, a 95% confidence level, and so on).

The more hypothetical simulations that are used, the better the result will be, but this will depend on how long you can wait and how fast your computer is. The large number of calculations required by this method means that the computation on a large, complex portfolio can take hours. However, with computing power becoming cheaper this is no longer such a major issue. The Internet is also enabling software firms to allow companies to use their computers to do the calculations, removing the need to invest in expensive in-house computing power. This type of outsourcing approach is becoming more popular, even in the investment banking community. Three sites pioneering this in the energy-trading industry are www.allegro.com; www.sungard.com/kiodex; and www.tradecapture.com.

Although the Monte Carlo simulation process is rather complex, users consider it to be the most precise and effective of the three methods discussed.

Strengths: It's the most precise/effective VaR model and can handle complex derivative portfolios, including options, to provide generally more realistic results.

Weakness: It's the most complex and the slowest to calculate. As an organization's trading activity/position increases over time, additional computer processing power and hardware upgrades may be required.

VAR RECAP

The great thing about VaR in its practical implementation and application across an organization is that the output of VaR calculations is easy for everyone to understand. This has been the key factor in promoting its widespread adoption across non-financial traders, energy companies and end-users. The output from VaR calculations is a currency value, which in the energy industry is usually given in U.S. dollars. It shows clearly how much an organization is risking over the chosen time horizon within a certain confidence level. If the VaR result for Trader "A" portfolio is US$2m but Trader "B" portfolio is US$3m, it is easy to see who is putting the company at more risk.

So, by using the above scenario of Traders A and B, a risk manager might report to his management that within a 95% confidence level, his company is risking a potential loss of no more than US$5 million over the next 24 hours. As a result, the energy sector can decide how to allocate economic capital as a trader or speculator and how to trade off risk and return.

VAR TO ILLUSTRATE HEDGE EFFECTIVENESS

Both producers and consumers can use VaR to assess and quantify the effectiveness of hedges in an easy-to-understand format. But it should be remembered that an effective hedge is not necessarily a profitable one.

It is possible to have an effective hedge that loses money on the derivatives side of the hedge but still allows the company to profit from cheaper physical energy as a consumer, or higher physical prices as a producer. Companies which are hedging may suffer an "opportunity cost" in economic terms, but as long as they do not have too much basis risk, the derivatives hedge + physical purchase/sell should net out.

Until VaR began to be adopted more widely by the energy industry (from around 1998 onwards), staff who were responsible for hedging programs in companies were often faced with difficult questions about why hedges lost money on the derivatives side of the deal. For them, it was difficult to show how effective a hedge was. Most of the time, companies would gauge the effectiveness of a derivatives hedge by whether it made money. But with VaR it can be shown that swaps, futures and/or options positions actually reduce a company's potential risk to exposure by a U.S.-dollar value. After all, the fundamental aim of hedging is to protect against disaster scenarios, to reduce balance-sheet volatility or profit/loss volatility and to protect operating profit margins from being eroded.

With VaR, it is easy to take a simple, practical approach to demonstrating the effectiveness of a hedge position. A physical energy position can be put into the VaR model to show how much money is being risked in the chosen time horizon and confidence level by not hedging. If an opposing hedge-derivatives position is added to the model, the reduction of potential risk exposure can be presented as a clear figure in U.S. dollars. This makes it easy for management from all divisions and business areas to appreciate the amount of risk reduction.

So, VaR can illustrate the effectiveness of a hedge strategy, or highlight that a supposed hedge is actually increasing risk because of a bad correlation between the physical energy and the chosen derivatives contract. This is particularly the case when using a "proxy" hedge, a derivatives contract (swaps, futures or option) that is not pricing against exactly the same pricing index as the underlying physical energy buy/sell. Thus, in rare cases, the amount of potential risk reduction is not worth the cost of hedging. (See "Basis Risk", Chapter 1, for more details.)

STRESS TESTING AND VAR

So, VaR can be used to provide a probability-based boundary on likely losses for a specified holding period and confidence level (for example, the maximum loss that is likely to be experienced over one day with a 95% level of confidence). It can also be used to assess the risk-adjusted performance of individual business units. However, we have to recognize that there are limitations to the ability of statistical models such as VaR to capture accurately what happens in exceptional circumstances. VaR may be able to tell us that within a 95% confidence level certain things will happen, but it does not tell us what might happen in that 5% gap.

By definition, exceptional circumstances occur rarely, and statistical inference is imprecise without a sufficient number of observations. Although Monte Carlo VaR simulation can get a user close to perfection through tens of thousands of calculations, stress testing is still advisable alongside this approach.

STRESS TESTING METHODOLOGIES

In stress testing, the two standard ways of developing scenarios are historical scenarios (using historical price data) and hypothetical scenarios. Energy-sector traders tend to use a mixture of both approaches.

Historical scenarios employ shocks that occurred in specific historical episodes. A simple way to do this is to identify days in the past that were "stressful" and use the observed changes in market-risk factors on those days. For example, a portfolio of market-risk exposures could be stress tested by seeing how its value would change given the changes recorded for market-risk factors for a day, or over a longer period. The selection of the day, or period, is typically based on "headline" disturbances, such as the Gulf War in the oil markets, Iraq's invasion of Kuwait, big OPEC decisions or the power crisis in California.

One advantage of this technique is that the structure of market-factor changes is historical rather than arbitrary. The fact that the market moves used are historical fact enhances the credibility of the exercise from the point of view of risk management, due diligence and, as a result, senior management. Another advantage of historical scenarios is their transparency. A statement such as "If the Gulf War happened tomorrow, the firm would lose X million dollars" is easy to understand and put into perspective.

One disadvantage of historical scenarios is that firms may (consciously or unconsciously) structure their risk-taking to avoid losing money on shocks that have occurred in the past, rather than anticipating future risks that do not have a precise historical parallel. This could represent a conscious choice on the part of traders, if firms give traders an incentive to minimize exposure to stress tests through limits or capital charges. It could also represent an unconscious choice, if traders overestimate in their own minds the likelihood of shocks of which they have had first-hand experience.

Another obvious but key disadvantage of historical scenarios is that they may be difficult to apply to derivatives products which did not exist at the time of the historical event in question. This is one of the reasons why hypothetical scenarios are also important.

THE HYPOTHETICAL OR SENSITIVITY STRESS-TEST APPROACH

One reason why an organization may choose to conduct hypothetical stress testing as well as historical stress testing on its derivatives portfolio is that hypothetical stress tests allow them to assess the extent to which the conventional wisdom (based on the history of recent market moves) may be driving position-taking (or lack thereof as the case may be).

Hypothetical scenarios use a structure of shocks thought to be plausible in some foreseeable circumstances for which there is no exact parallel in recent history. This raises questions about how far back in history to go for this. Generally, many energy traders do not look back beyond more than five years of historical data. This is because the further one looks back in history, the greater the chances that the fundamental supply/demand factors of the energy market will have changed. This, in turn, affects the benefit of applying that historical price movement to a current live derivatives portfolio.

Perhaps the most prudent approach to stress testing is to use a mixture of the last five years' data plus a few snapshots of data related to particular disaster scenarios such as the Gulf War.

LIMITATIONS OF STRESS TESTS

In practice, stress tests are often neither transparent nor straightforward. They are based on a large number of risk-management choices as to what risk factors to stress, what range of values to consider, and what timeframe to analyze. Even after such choices are made, a risk manager is faced with the considerable tasks of analyzing the results and trying to identify what implications, if any, the stress test results may have for the organization.

A well-understood limitation of stress testing is that there are no probabilities attached to the outcomes. Stress tests simply help to answer the question "How much could be lost?"

SUMMARY

Over recent years, the development of VaR models of risk measurement have greatly improved the risk manager's ability to assess market and credit risks and to help others in the organization understand what those risks mean. However, even the most rigorous VaR analysis cannot capture the potential effects of all exceptional circumstances, and for this reason VaR should be used alongside periodic stress testing of an organization's trading, derivatives portfolio and exposures, in order to obtain a balanced risk-measurement policy.

Traders and management have often told me that VaR is great but it is extremely expensive to get a system. However, this is not the case now, with many firms offering excel-based systems which are good for small to medium-sized firms and/or for the traders to run quick VaR analytics on their desktop before adding a trade to their portfolio. An example of one such system is Fincad XL, more information about which can be found at www.fincad.com/.

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CHAPTER 9

Questions to Ask When Establishing a Risk-Management or Trading Program

Following are some of the key questions to ask when collecting information that will help to create a policy for the usage of derivatives as a trader, as a speculator or as a hedger.

- What is your organization — a consumer, a producer or a trader?
- In which areas does the organization have price risk — products? Fixed or floating price risks?
- Is the organization's aim to hedge or to trade? Which of the following is it trying to do:
  - Mitigate a disaster-risk scenario?
  - Protect budgeted levels?
  - Control overall price risk?
  - Trade risk as a speculator?
- Does it let traders speculate or only hedge?
- What is the total volume of energy it wishes to hedge or how much does it wish to trade?
- As a hedger, how much does it want or need to hedge?

(When hedging, look at up to 50% of exposure for general day-to-day hedging requirements. Any hedging over 50% of consumption or production volume is speculative and should only be considered as rare-case pre-emptive measures ahead of a "disaster scenario". This could be during protracted periods of extreme high prices (as a consumer) or extreme low prices as a producer of energy. Or it could be as opportunistic hedging when historically high profitability can be ensured by locking in low prices as a consumer or high returns as a producer.)

One exception to this guideline is when an organization, as a consumer, has 100% of sales/income fixed (for example, a charter airline which has pre-sold all seats on flights and is exposed to floating jet-fuel prices.)

Another example would be if your organization is a trader buying a feedstock for its own refinery system, or if you are buying power or gas for your company and you need to fix this cost so that other departments in the organization can cost delivery of finished goods or products for customers.

Usually, end-users will hedge around 20–30% of volumes around budget levels up to 18 months forward, leaving an additional 20–30% (up to 50% total) for opportunistic hedging if levels come below budget levels.

Also, end-users should generally look to have another policy for hedging in times of extreme price moves, allowing the energy-procurement department or the dedicated risk-management departments to act quickly to protect the firm against extreme price moves that might be seen, for example, in times of war. For instance, if you were an electricity consumer in the United States when power costs spiked to US$10,000 per MWh, you would have wanted to protect yourself before that happened, perhaps by up to 100%. Or as an airline, as tension increased in the Gulf, you would have wanted to protect yourself ahead of the Iraq/Kuwait confrontation.

Addressing these questions will help an organization to look at the next step of putting together a risk-management policy. In this, answering the following questions will prove useful:

- **What types of derivatives should be used — Futures? Options? Swaps?**

If options are chosen, will these be OTC or on-exchange? Will traders be allowed to sell options as well as buy? (This can incur open exposures for companies if not carried out as part of a larger structure. Also, in some derivative disasters, the sale of options has been used to generate cash flow to cover up losses elsewhere in a portfolio.)

- **For what tenures/how far forward will the organization use these derivatives?**

Normally, an organization should state in its risk-management policy (as a hedger) or derivatives-usage document (as a speculator) which derivative types can be used, in which markets and how far forward each type of derivative contract (futures, options, swaps) can be used in each market (for example, Singapore gasoil, Dubai crude, Brent, fuel oil Rotterdam).

- **Which derivatives markets should be used?**

For **hedgers**, this decision will be based on how well the available energy-derivative markets correlate in terms of price (and also causation relationship) with the underlying energy markets that are to be hedged and in which the organization has price-risk exposure. Once a list of possible energy derivatives that match requirements is selected, the organization must then review this list with the contract liquidity in mind (checking with brokers such things as the average daily volume, the normal bid/offer spread gap, and the number of active counterparties). If liquidity is bad then the organization may have to consider a proxy hedge, such as ICE Brent Futures to hedge Middle East crude exposure. ICE Brent is not a Middle East crude contract, but it has high liquidity and has some price correlation relationship with Middle East crudes. This might be used instead of the OTC Dubai or Oman swaps, which are much more closely linked with Middle East crude but whose price transparency and overall liquidity may not yet be good enough for some organizations e.g. Dubai Futures www.dubaimerc.com.

For **traders/speculators**, this decision will be based upon the liquidity of the energy derivatives markets (volume and number of counterparties trading the market) and also the level of price transparency that exists. For a trader/speculator, the lack of price transparency can be an attraction, whereas for a hedger, price transparency is more important than liquidity. Liquidity is more important for a trader since he/she will normally wish to trade out/close out a position ahead of its expiry/settlement. An organization that is hedging will normally let derivatives contracts run their full term through to expiry as it is hedging an underlying energy-price risk. So, for a hedger, the ability to trade out/close out a derivatives position may be less of a concern. The price linkage between the derivative and the energy-price risk being hedged may be more important to the hedger than the liquidity of the market.

- **How will the operations department manage these derivative positions?**

Will new IT infrastructure be needed to process and manage these positions? Does the organization have the relevant skill sets or will training be required prior to the start of this activity?

How will these derivative positions be valued — against third-party forward-curve assessment (for example, Platts Forward Curve) or broker/dealer quotes?

How often will these positions be valued — Daily? Weekly? Monthly? Quarterly?

- **If a trader/speculator, how will the position limits be set?**

Will they be volumetric limits or notional-value limits? Will they be set by tenure and product? Which traders can trade what products and which types of derivatives can they trade? Who will be responsible for monitoring these positions and reporting any break in the organization's usage policy?

What reports will be produced to assist risk-monitoring/ performance function — open-position reports? market-value reports? profit-and-loss reports? hedge-effectiveness reports? (This last provides a correlation analysis of the derivatives used for hedging and the underlying energy risk being hedged.)

How often will these reports be produced, who has to see them and whose responsibility is it to sign them off as read?

Before any activity begins, the organization must assess the operational risk of this new business, as well as the credit, market, legal and tax risks. Who will be responsible for conducting regular risk reviews?

This is certainly not an exhaustive list but answering all of these questions can assist an organization to start looking at policy decisions and what it proposes to let its risk managers and traders do. Accounts departments can also get a good idea of what type of accounting for derivatives will have to be handled, either as hedges or speculative trades (see Chapter 17 on accounting for derivatives).

All this information and feedback on it from the relevant line managers in the organization should then be collated for presentation to the board of directors/board of management, who should create a general policy and reporting structure for the organization.

Line managers should then take this general policy and, with reference to the Board's decision, fine-tune a more detailed risk-management derivative-usage guidebook for traders, operations and managers. This operational document should be submitted again for approval by the board of directors.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 10

Management Controls

THE COLLAPSE OF BARINGS

On 18 July 1995, the world's financial institutions received a shocking wake-up call. That was the day when the U.K.'s oldest bank, Barings, officially collapsed, posting a loss of US$1.3 billion. The firm's entire capital had been wiped out as a result of unauthorized and extremely risky derivatives investments in the Japanese futures markets, made by one of its young investment officers, Nick Leeson. Many in the media blamed the disaster on the nature of derivatives themselves, but the real reason for the bank's collapse was the complete lack of enforced management controls throughout the organization.

There is a clear distinction, though, between derivative losses from unknown risks arising from fraud, as in the case of Barings, and those losses incurred through big bets in the market that just go wrong. In 2006 the energy-trading industry witnessed the lightning-fast implosion of an American hedge fund, Amaranth, which lost US$5 billion in a bad bet on the price direction of American natural gas. This loss was almost five times the size of Baring Bank's. Amaranth billed itself as a "multi-strategy" hedge fund but its exposure to natural gas suggests it was over-reliant on a single strategy to earn the more than 20% annual returns it was making for investors before its collapse. All information in the market suggests that management knew the risks the firm was taking, so it's not something we need to explore further in this chapter.

Barings collapsed because it could not meet the enormous trading obligations that Leeson had established in its name. When it went into receivership on 27 February 1995, it had outstanding notional futures positions on Japanese equities and interest rates of US$27 billion:

US$7 billion on the Nikkei 225 equity contract and US$20 billion on Japanese government bond (JGB) and Euroyen contracts. Leeson had also sold 70,892 Nikkei put and call options with a nominal value of US$6.68 billion, which had allowed him to generate upfront premium (positive cash flow) to offset any losses on the futures. The size of the Baring positions was obviously huge, particularly when compared with the bank's reported capital of about US$615 million.

The alarming size of the positions should have been clear to Barings' management at the time. In January and February 1995, Barings Tokyo and London transferred US$835 million to the Singapore office to enable Leeson to meet his margin obligations on the Singapore International Monetary Exchange (SIMEX). The transfers were so large that Barings' management was asked several times by the British Treasury why so much cash was being sent to Singapore. If the managers responsible had taken notice of these warnings and undertaken a proper investigation of the activities of the Singapore office at that time, the collapse of the bank may well have been averted.

The cash, or at least around US$500 million of it, was put down as loans futures to customers of Barings Futures Singapore. The credit-risk implication of the client advances represented by these "top-up" balances would have been significant if the total funds remitted to Singapore had been to meet genuine client-margin calls. Yet the credit-risk department did not question why Barings was lending over US$500 million to its clients to trade on SIMEX, and collecting only 10% in return. Barings' financial losses would have been significant if some of these clients had defaulted, yet it did not seem to have any idea who these clients were.

No credit limit per client or on the total top-up funds was set. Indeed, clients who were advanced money this way appear not to have undergone any credit-approval process. The credit committee never formally considered the credit aspects of the top-up balance although they could see the growth of these advances as recorded on the balance sheets. To put it plainly, the credit-risk controls of Barings did not exist.

The fact that such important indicators as cash flow and credit risk were ignored is bad enough, but the management of Barings also broke one of the other key rules of any trading operation. They allowed Leeson to settle his own derivatives trades by putting him in charge of both the dealing desk (the front office) and the back office (the administration of derivatives trades). This was a clear breach of the principle of segregation of duties. To put it simply, the front office executes derivatives trades, while the back office records all the trade confirmations, settles the trades, checks them and assesses the accuracy of prices used for its internal valuations and marked-to-market reports. It also accepts and releases payments for derivatives trades. Since Leeson was in charge of the back office, he had the final say on payments, ingoing and outgoing confirmations and contracts, reconciliation statements, accounting entries and position reports. In other words, he was perfectly placed to relay false information back to London. Abusing his position as head of the back office, Leeson hid information in the now infamous "88888" account. Barings London did not know of the existence of this account because Leeson had asked a systems consultant to remove error account 88888 from the daily reports which Barings Futures Singapore sent electronically to London.

The lack of segregation of duties at Barings Singapore was perhaps the most serious failing of management controls. But what was even worse in this case was that some managers were fully aware of this position. Tony Hawes, the group treasurer, had reported the unsatisfactory nature of the situation as early as February 1994, but nothing was done. He subsequently made his views known to James Baker, who undertook an audit of Barings in Singapore in July/August 1994. The subsequent internal report made specific recommendations on the segregation of roles, but again there was a major control failure and none of the recommendations were implemented.

Since Leeson controlled the back office and because Barings had no independent unit checking the accuracy of his reports, the market-risk reports generated by Barings' risk-management unit were totally inaccurate. Leeson's futures positions showed zero market risk because trades were supposedly offset by opposite transactions on another exchange (arbitrage between SIMEX and TOKYO). The unfortunate result was that Barings' shareholders learnt the painful truth behind the saying "Garbage in, garbage out" because a system is only as good as the data put into it.

Barings' problems could also have been avoided if appropriate management had reviewed transactions and management-information reports and held discussions with appropriate personnel about the nature of business transacted. Such approaches provide line management with an objective look at how decisions are being made and ensure that key personnel are operating within the parameters set by the organization and within the internal control framework — the guidelines and policies for the usage and reporting of derivatives.

But what really shocked the financial world and made many companies rethink their internal reporting and control structures was the simple fact that the Nikkei 225 and JGB futures contract that Nick Leeson traded were plain-vanilla derivative instruments. As listed contracts, they were extremely transparent (unlike OTC) and Barings was required to pay (or receive) daily initial and variation margins and so needed funds from London. In January and February 1995 alone, Leeson asked for US$835 million. He could not hide his build-up of positions on the OSE because the exchange publishes weekly numbers. Other banks could see Barings' enormous positions, and many assumed that the positions were hedged as arbitrage positions because such large positions were far too big compared to the bank's capital base.

Barings' collapse is an extreme example of failures of internal control and information systems, all adding up to a massive unexpected loss. Derivatives can be very beneficial for organizations looking to control price risk or for companies looking to trade in the energy-derivatives markets in a controlled environment. However, senior management of companies using derivatives must never disregard the guidelines and recommendations which have been drawn up by practitioners, regulators and risk-management advisors.

THE LESSONS OF HISTORY

Dealers and end-users should use derivatives in a manner consistent with the overall risk management and capital policies approved by their Boards of Directors. These policies should be reviewed as business and market circumstances changes. Policies governing derivatives use should be clearly defined, including the purpose for which these transactions are to be undertaken. Senior management should approve procedures and controls to implement these policies and management at all levels should enforce them.

This short paragraph was written by the G30 group in the early 1990s and it serves as a good starting point to explain controls for derivatives users. (The Group of Thirty, established in 1978, is a private, nonprofit, international body composed of very senior representatives of the private and public sectors and academia. See www.group30.org)

Particularly important is the recommendation that organizations should have a policy that defines the purpose of using derivatives; in other words, it should be clear whether they are being used for speculation or for hedging. This is even more relevant in today's market, since even non-bank users are now required to make accounting disclosures for derivatives. The accounting approach adopted is determined by whether the derivatives contracts are for hedging or speculation. This is an example of how controls and requirements are interlinked and how policies need to be reviewed regularly. Accounting and reporting regulations can modify controls and reporting requirements to the outside world.

Many control failures that resulted in significant losses for derivatives users could have been substantially reduced, or even avoided, if the organizations had established strong risk-management controls. It is worth pointing out that the occurrence of deliberate fraud in organizations is very low; in the majority of cases the main problem is simple human error. By examining what could be termed derivative "disasters", such as the collapse of Barings, it can be seen that the typical control breakdowns have been in five broad categories:

- **Management control**

Senior management can weaken controls by promoting and rewarding managers who are generating profits but who fail to implement internal control policies or address issues identified by risk-management reviews and internal audits. Such approaches send a message that internal controls are considered secondary to other goals in the organization, and this in turn can reduce the commitment to, and quality of, its controls.

- **Risk assessment**

Companies which have sustained large losses in the past have often neglected to assess the risks of new derivatives instruments or trading activities. It is essential to review procedures and risk-management systems when an organization decides to move from using simple derivatives (futures, plain-vanilla swaps) to more complex derivatives such as traded options or OTC option structures.

- **Segregation of duties**

One of the main causes of derivatives disasters has been the lack of segregation of duties. This has sometimes occurred when senior management have assigned responsibility for supervising two or more areas with conflicting interests to a single individual. For example, if one individual is supervising both the front office (execution of derivatives trades) and the back office (the department where trades are reconciled and exception reports are generated for management information), then this person's duties are clearly not properly segregated.

- **Reporting (communication)**

To have any chance of being effective, policies and procedures must be communicated to all staff involved in the use of derivatives. Senior management should ensure that the organizational structure and management accountability are clearly defined. Sometimes losses in companies have occurred because key staff have not been fully aware of the usage policies of their own organization. As a result, activities that were outside the scope of the authorized usage of derivatives were never reported to higher management until it was too late.

- **Reviews/audits**

There have been cases in which audits or internal reviews have exposed weaknesses in a company's controls or reporting structures but these have been ignored by senior management.

CREATING A RISK-MANAGEMENT OR TRADING POLICY

The risk-management and trading policy parameters for the usage of derivatives will vary from organization to organization but here are some key guidelines and key stages that can help.

- **Component 1 — board-level approval**

The Board of Directors should establish and approve an effective policy on the use of derivatives which is consistent with the strategy, commercial objectives and risk appetite of the underlying business and should approve the instruments to be used and how they are to be used.

The Board should review the proposed purpose and use of derivatives and ensure that this is consistent with management capabilities, the company's financial position and its commercial objectives, including any legal restraints. The Board should approve a list of derivatives and the reason for using them, and ensure that the appropriate policies and control procedures are in place. Two or more Board members should be given the responsibility for overseeing and reviewing the correct usage of derivatives and an independent review of risks and rewards. The Board would also ensure that management reports are fit for the purpose and that ongoing training of key personnel is given.

- **Component 2 — policies and procedures**

Senior managers should establish clear written procedures for implementing the derivatives policy set by the Board. These should cover trading authority (who can trade and what they can trade); management reporting lines; position limits in derivatives markets; counterparty approvals; documentation approvals; and valuation procedures.

Checklist:
1. Appoint a senior manager to be responsible for policies and procedures.
2. Design and document limits for market and credit risk.
3. Design and document procedures for when limits are passed.
4. Design and document procedures for approving brokers or counterparties.
5. Ensure that accounting policies have been established.
6. Ensure that all taxation implications have been considered.

- **Component 3 — control and supervision**

Senior management should ensure that derivative activities are properly supervised and are subject to a clear framework of internal controls and audits to ensure that derivative usage is in compliance with corporate policy (and, in the case of a financially regulated institution, external regulation).

Checklist:
1. Regularly review the level of expertise within the organization.
2. Perform an independent review of the internal controls.
3. Ensure that management reports are fit for the purpose.
4. Examine computer systems to ensure that they cannot be tampered with by unauthorized personnel.
5. Ensure regular internal-audit checks.

- **Component 4 — organization, roles and responsibility**

Senior management should establish a sound risk-management function which provides an independent framework for reporting, monitoring and controlling all aspects of the risk matrix (see Chapter 1).

Checklist:

1. Allocate very clear responsibilities to individuals, using organization charts and clear job descriptions.
2. Use appropriate market-risk and valuation techniques.
3. Ensure that cases where position limits have been exceeded are reported to the Board of Directors (in exception reports).
4. Perform price-movement stress testing to assess the effect of abnormal market movements on positions.

- **Component 5 — credit procedures**

All credit risks to which the organization will be exposed should be measured and analyzed, and these risks should be minimized through the use of effective credit management (for example, the collateralization of positions with credit-weak counterparties, credit defaults derivatives, or credit insurance).

Checklist:

1. Analyze the risks inherent in both exchange-traded and OTC derivatives.
2. Minimize credit risk through netting agreements and other techniques.
3. Establish credit-risk limits in derivatives markets (overall limits) and counterparty-by-counterparty limits.
4. Establish procedures for authorizing credit-limit excesses. Decide on the person responsible for giving approvals and the person who will deputize in his or her absence.
5. Establish policies and procedures to follow in the event of a counterparty or broker becoming insolvent. If positions are held in futures markets with a broker, the organization's funds should be segregated from the operating capital of the broker. This is the regulatory norm these days, but it is worth checking the agreements with the broker as it means that the funds are protected if the broker goes bankrupt.

- **Component 6 — legal and documentary**

Procedures should be in place for monitoring legal risk. These should cover legal capacity, authority, compliance and the need for the appropriate documentation.

Checklist:

1. Establish that the organization has the power (internally and externally) to use derivatives in the manner envisaged.
2. Ensure that the authority to deal in derivatives is delegated to the appropriate staff.
3. Complete a list of authorized existing and potential brokers and counterparties. Note any restrictions.
4. Obtain warranties from each broker or counterparty as to its power to deal in derivatives.
5. Review documentation.
6. Use master trading agreements for OTC derivatives. The use of standard ISDA agreements for cash-settled OTC deals will mean that the organization will have access to lots of legal and other expertise on matters relating to their derivatives deals. This can help keep upfront legal costs down, as well as create greater legal assurance and certainty in situations of default or disputes.
7. Ensure that margin or credit arrangements are well documented.

All of the guidelines and information compiled from these components of the management control matrix will help an organization to produce a risk-management policy document (sometimes referred to as "a risk-management or derivatives usage procedure manual"). This should be distributed to all heads of business units in the organization and to all front-office and back-office staff. The policy document will enable staff to conduct their day-to-day activities effectively, referring to the document as required to ensure that they are operating in line with the organization's operating procedures. A section on management reporting lines should clearly inform staff who they should report to for special approval if they need to take any action involving derivatives contracts outside the normal boundaries set by the policy document.

CORPORATE DERIVATIVES RISK-MANAGEMENT POLICY-AND-PROCEDURES DOCUMENT

The primary components of a sound risk-management process are a comprehensive risk-measurement approach (for example, VaR); a detailed structure of position limits; guidelines and other parameters used to control the usage of derivatives (either for hedging or speculative purposes); and a strong management-information system for controlling, monitoring and reporting risks.

Expanding on these primary components we can illustrate the key contents of a typical derivatives policy or manual.

- **Example of key contents in policy document**

1. What is the organization's purpose in using derivatives? Speculation (to take advantage of risk opportunities)? Hedging (to reduce price-risk exposures)? Or both?
2. What type of derivative instruments is the organization willing to utilize? On-exchange futures? On-exchange options (traded options)? OTC swaps? OTC options (exotics)?
3. Which markets can the organization's traders use? What are the limits of the derivatives positions? What are the overall company-wide limits? What are the limits for individual traders? What are the position limits for each of the energy-derivatives markets to which traders have access?
4. What percentage of the energy exposure should be hedged? What is the minimum amount to be hedged? What is the extra volume allowed for opportunistic hedging if prices are within budgets?
5. What are the limits on the tenure of the derivatives used? This may be listed by energy-derivatives market. The decision on how far forward traders can trade in a particular market will depend on counterparty creditworthiness and the general liquidity in the market.
6. Which counterparties are used for OTC? A list of authorized counterparties should be regularly updated and passed to traders (front and back office) to prevent accidental unauthorized trades. There should be a clear policy on credit quality required for counterparties in OTC markets.
7. There must be a clear policy on the types of legal documentation that must be in place prior to any derivatives trading commencing with new counterparties.
8. There must be clear management reporting lines. A clear diagram showing reporting lines will help front- and back-office staff and management handle problems quickly and efficiently.
8. Reports are to be generated daily. There should be a list of reports (exception, position, profit/loss…) and who is to produce them on a daily basis.

9. There must be a clear policy on who is to see the exception reports, who must sign off and who is responsible for taking action to resolve matters.

BACK-OFFICE SYSTEMS

An organization may succeed in putting in place a clear management and reporting structure, with a written risk-management policy with which all staff are familiar, but all this effort will have been wasted if an appropriate back-office system is not in place. The back office is the key for protecting an organization, as it is there that all data on trades are collected, where positions are valued each day and where core management-information reports are generated.

Any back-office or control system is only as good as the quality of the data put into it. These inputs incorporate new transactions; exercises (options that expire and create a new swap/futures position or even exercise into physical); market price data; close-outs and settlements; deliveries; receipts and payments; and data on any documentary credits/ guarantees from trading counterparties (values, expiry, type).

- **Controls of input data**

Whether a reporting/control system is manual or computerized, the proper control and validation (double-checking) of input is essential. Responsibility for particular input tasks should be clearly allocated, with password control used for screen operators. Input routines should require a standard format containing all relevant detail for a new transaction (for example, date, counterparty and full transaction data — volume, settlement and price). Source documents (trading tickets from trading desk) should be time-stamped, or otherwise marked to indicate the time of execution, and then also marked by the back office to indicate that they have been entered. All inputs should be subject to validation routines (for example, computer proof listings of new transactions entered requiring confirmation or validation prior to updating the main transaction records). A unique reference number should also be assigned within the system to each item of validated data — on most occasions this number is the actual ticket number written out and time-stamped by the trader on the trading desk.

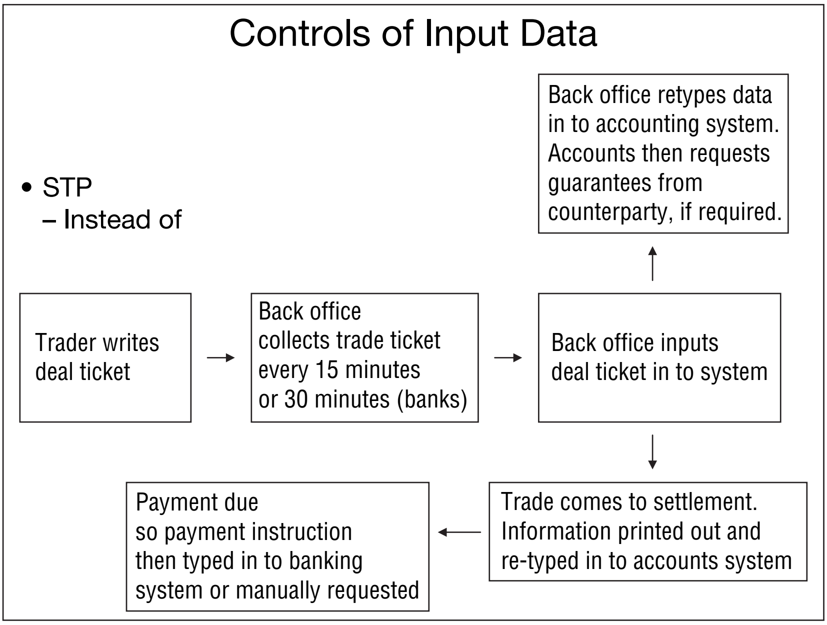


FIGURE 10.1 A non-STP approach to data input, with a high chance of error creation

- **Straight-through processing**

Some companies are already moving towards what is known as "straight-through processing" (STP). Futures markets are very close to this already, with trades from the exchanges going into clearing house systems and clearing broker-member systems automatically. The OTC market is slowly moving this way too, with several organizations introducing e-confirms for OTC derivatives transactions. These allow confirmations of deals done on and off electronic trading platforms to go straight into counterparty back-office and risk-management systems. OTC is generally still recapped by postal confirmations and faxes. By reducing the human involvement in the trade-processing and back-office management, companies are already trying to reduce the risk of human error in inputting deal data.

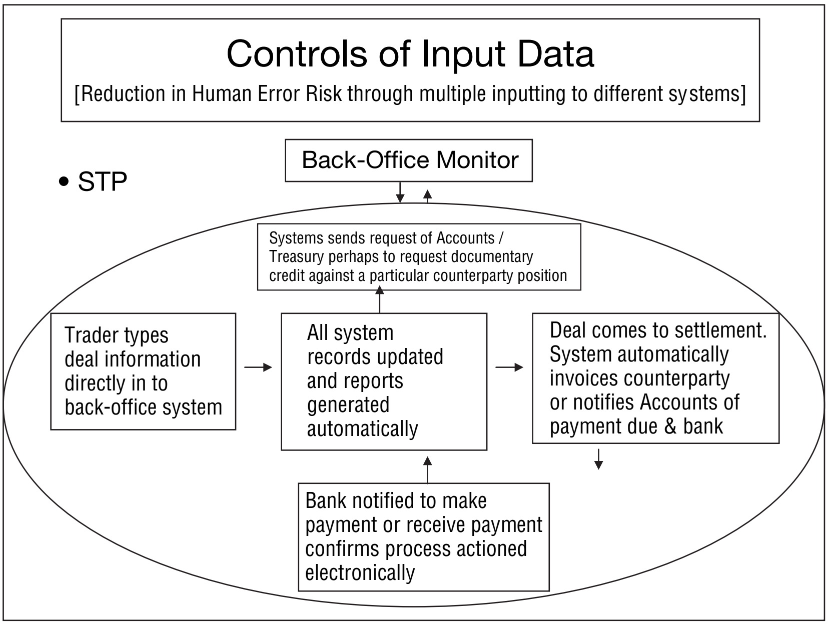


FIGURE 10.2 Controls of input data using the straight-through processing approach

According to The International Swaps and Derivatives Association (ISDA), many organizations are now well on the way to implementing STP as a key part of their back-office systems. The Association's Operational Benchmarking Survey Summary was based on responses from 65 firms around the world and reported that front-office trade data is available for same-day processing for all forward rate agreements and for 98% of plain-vanilla swaps. It also reported that errors in front-office trade data, which most commonly occur in dates, are more common for credit derivatives (21%) than for plain-vanilla swaps (17%).

It appears that plain-vanilla swaps are more automated than credit and equity derivatives and this is something we look at in more detail in Chapter 15 on operational risk. It became a big issue for credit derivatives markets and regulators in 2004/2005.

It is also interesting that the most common results show that there is either no automation or substantial automation, suggesting an "all or nothing" approach: that is, once a firm institutes some automation for STP, it applies it across the company. Functions with a high degree of automation include the transfer of data from the front office to the back-office operations systems, transfer of trade data from the operations system to the general ledger and the addition of data to the front-office trade record.

- **Reports and records**

Transaction records

A back-office system should create and maintain complete records of all transactions and should be able to break reports down into trader, counterparty (for OTC products), product traded, trade/executed date, volume, time traded, and broker used, where appropriate.

Position records

With open positions, it is essential that each input transaction and settlement is accurately reflected in statements of position

Margins and equity

Exception reports assist effective monitoring by highlighting potential risk situations, such as position limits being broken; the counterparty's equity falling below a certain level; and contracts nearing delivery date (futures) or expiry (options), or pricing out (swaps).

Counterparty documentation

Appropriate counterparty documentation should be generated for the confirmation (on a daily basis) of a contract settlement account, to advise the counterparty of details of contracts closed out (netted off) or priced out, and the profit or loss agreed and then settled between counterparties.

List of Reports to be Produced by Back-Office/Mid-Office Personnel and Systems for Management

Management information/risk manager

- Exception Reports and Positions close to expiry
- Critical Area — Knowledge of different delivery processes for on-exchange derivatives such as Futures is vital.
- Position Reports
- Profitability Reports presented in various ways
  - by department/individual trader
  - by market/product
  - by period — showing performance trends
  - Value-at-risk for the firm — calculations

WHO SHOULD LOOK AT THE REPORT AND RECORDS?

In most medium-to-large organizations, a corporate treasurer or risk manager is responsible for identifying and managing risk. Where the scale of the trading or risk-management activity is not sufficient to justify a separate, independent risk-management function, responsibility for monitoring risk is usually allocated to members of management who are not directly involved in the day-to-day management of risk (for example, traders).

DERIVATIVE BACK-OFFICE MANAGEMENT

It is essential to have tight security on back-office systems. A company should not rely on just one risk manager to monitor or pick up errors. It should also have a system that prevents people who are active in the risk-management and trading areas from altering records.

To check for irregularities, some banks and brokers have asked their employees to take at least five consecutive business days as holiday at short notice. The person who then takes over has a good chance of picking up on mistakes that have been made through operational error, losing positions which have been concealed or, indeed, fraud.

This should certainly allow the organization to expose skill shortages and perhaps target staff for further training so that it is not over-reliant on any particular individual.

• Internal controls and the back office

Here is the basic framework of internal controls that any back-office system should be able to support:

Risks: Business; position; human and operational; credit

Fundamental controls: Authority levels and limits-setting features; automatic exception reporting and monitoring of position limits; profitability reporting

Organizational controls: Legal considerations; policy monitoring; segregation of duties and the operation of internal checking

Position risk: Trading, types of derivatives; limits in markets; limits with counterparties (OTC swaps); monitoring and reporting against limits; hedge reporting

Counterparty authorization: The back-office system should preferably be integrated with the trading desk in order to stop trades being finalized with counterparties who have already exceeded credit limits or position limits. Remember, when your traders agree the deal, regardless of whether it is a futures trade or an OTC swaps trade on the telephone, your firm is committed.

Counterparty set up: The credit department or risk manager should be the only people able to set up new counterparties on the system. They should also be the only people to set trader and counterparty position limits.

Ideally the back-office system should be able to produce automatically an alert or print-out of exception reports (for example, loss limits, credit-limit breaches by counterparties, and internal position-limit breaches).

• Operational risk and the back office

It is difficult to talk about internal control systems without looking at the structure of back offices. Operational risk then comes into play in designing the back office. One definition of operational risk is the risk of loss caused by failures in operational processes or the systems that support them, including those adversely affecting the organization's reputation, and legal enforcement of contracts and claims.

So, it is important to structure the back-office system in such a way as to help prevent underlying causes of operational risk and, in turn, to keep internal controls and risk-management processes operating effectively. (See Chapter 15 on operational risk.)

ROLE OF EXTERNAL/INTERNAL AUDIT AND COMPLIANCE

Derivative operations should be subject to periodic reviews (for example, quarterly, half-yearly) by the company's internal audit function or external auditors if the necessary in-house expertise is not available.

It should be the responsibility of the Board of Directors to ensure that the internal-audit and compliance departments (if applicable) are staffed with personnel with sufficient skill and expertise to undertake reviews of the company's derivative operations. The exact role of external auditors and the processes that they use will vary from country to country. However, auditors should check that financial statements are free from material mis-statements, and check the derivative transactions and records supporting financial statements and balances and disclosures. An external auditor should assess the accounting principles used for derivatives, and also comment on the scope, adequacy and effectiveness of the company's internal-control system, and derivative-pricing methodologies (if any) including any existing internal-audit approach/system.

RECONCILIATION AND ACCOUNTING: KEY POINTS TO CONSIDER

Large profits that are not properly understood can often be a bigger danger than large losses that are understood all too well. Derivatives disasters have shown that people who never take holidays or who always stay late are not necessarily great examples of dedication to their jobs. Their "work lifestyle" may be covering harsher business realities. Accounting entries can be manipulated, cash disbursements cannot. Cash is the fundamental control, so make sure it adds up. Unfortunately, more often than not, accounting losses reflect a business reality.

Last but not least, computer systems should be carefully monitored. Computers are an open door to the very nerve centre of a business. It is important to ensure there is good security on the network and that computer data is backed up as often as possible, preferably off site.

RISK-MANAGEMENT REVIEW

A risk management review is something that should be done on an annual basis at the very least. Its purpose is to provide guidance for management on ways to improve existing operational procedures and controls, or to highlight lack of controls in specific areas where regulations may have changed since the last review.

This review is usually carried out by an independent, external consultant. However, in a large international organization this could be done by risk-management staff from another office, as long as those conducting the review are considered independent of the operation they are reviewing.

Risk-management reviews, unlike audits, focus on providing valuable feedback to management so that they can improve processes and controls to keep up with the latest industry or regulatory guidelines. They tend to rely more on verbal representations from staff than an audit.

When auditing companies, most large accounting firms look at trading controls and reporting structures and quite often auditors will make comments or notes in their annual accounting reports.

THE COLLAPSE OF ENRON, 2001

No single factor brought Enron crashing down to earth from its sky-high success. The involvement of key individuals like Jeffrey Skilling (the former CEO), Kenneth Lay (the former chairman and CEO) and Andrew Fastow (the former Chief Financial Officer) is already well documented, so this section will focus on the general failure rather than on individuals.

So, what were the possible combinations of factors in the failure of risk-management processes that contributed to Enron's downfall? The framework of the five key internal controls, as illustrated in Figure 10.3, can be used to answer this question.

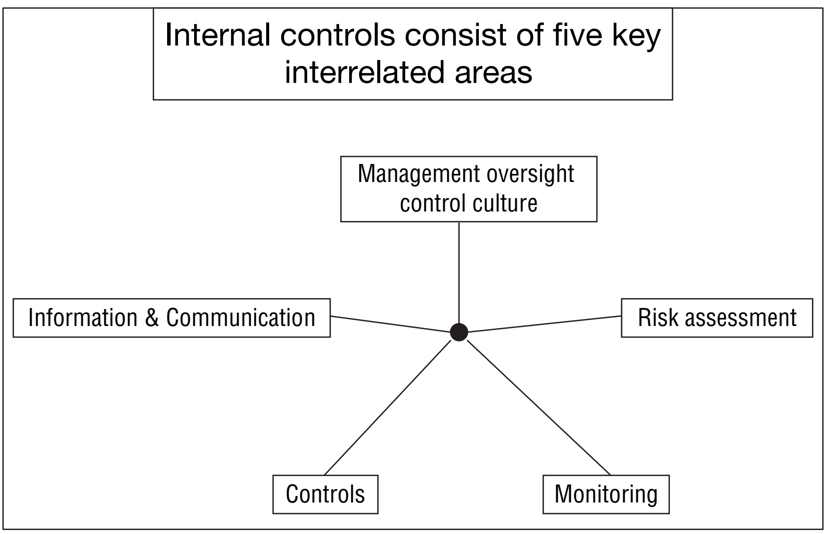


FIGURE 10.3 Framework of key internal controls

- **Management oversight control culture**

The problems at Enron were top-down; no single rogue trader was present, as was the case with Barings Bank. There were position controls and state-of-the-art risk-management systems in place to document sophisticated derivatives instruments and trades. However, management had been spurred on by stock-option profits to develop an expansionist culture at (it would appear) any cost. For Enron, this meant expansion in revenue and markets covered, and new market activities were seen as positive and good for public relations. Also, in the boom years of the dot-com era, stock investors were focusing on percentage revenue increases to boost stock prices.

Enron's employment culture affected its risk-management culture. Its hire-and-fire policy meant that employees had to operate in a cut-throat environment where they not only had to compete with the outside market, but were in constant strong competition with colleagues, with the threat of unemployment continually hanging over them. In this working culture, most employees were afraid to express their opinions or to question unethical and potentially illegal business approaches. If they reported these to the senior managers who were creating this environment, they risked getting fired. No reporting structure can save a company if the top management is at fault. Shareholders of trading companies should ensure that the management operates truly independent audit operations, not only for accounting but also for risk-management procedures and the handling of derivatives.

One possible route for restoring shareholder confidence in a shaken-up industry could be to offer the staff and management of trading companies access to external auditors if they feel they ever have a concern over business practices in their organization. Since the Enron collapse, it has become even more popular to introduce business ethics training across trading organizations.

- **Risk assessment**

Enron may have had sophisticated risk-management systems but the expansionist policy pushed by senior management to generate ever-bigger revenues to fuel the share price accelerated Enron's move into markets in which it had little experience. It was reported that in every Enron trading room around the world there was a price-ticker screen showing the Enron stock price to staff. This policy flouted the fundamental principle of risk management: "Know your market". It is essential for companies to ensure that they have sufficient internal expertise and resources to manage derivatives or trading in these new markets. However, because the focus at Enron was always on the share price, risk assessment took second place. The biggest illustration of this was Enron's move into bandwidth trading (the trading of telecom time via cable). Enron's rapid expansion into new markets placed it at a disadvantage against more experienced players in those fields and, in turn, put it at risk of big losses. From its core business of natural gas, oil and power trading, it ended up in new, low-liquidity rather esoteric markets such as sea freight, pulp & paper, Japanese aluminium, and Australian and Japanese weather derivatives, as well as bandwidth.

- **Controls**

In Enron's case, one big failure of controls appears to have come from the lack of appropriate external regulatory controls that allowed Andersen Accounting to audit and also consult for Enron. There was a clear lack of segregation of duties and, for fear of losing a very profitable consulting business (compared to the lower fees from accounting auditing), it is thought that a lot of tough questions on how Enron was operating were never asked by Andersen.

- **Information & communication/monitoring**

Enron was at the forefront of information and communication systems but, as they say, information and reporting is only as good as the data being put into the system. Failures in the company's risk-assessment, controls and management oversight meant that these state-of-the-art information systems communicated a reflection of the reality, rather than the true reality, of the financial health of the organization. So it really did not matter if someone was monitoring the data coming out because it still would not have stopped the collapse of Enron.

WHAT CAN WE LEARN FROM ENRON?

It is relatively easy for the management of a company to develop a risk culture that rewards people by increasing revenues in any way possible. The company can simply hire the brightest graduates and give them the resources they need. They will build revenues and push the stock price through the roof. However, as Enron shows this is not a sustainable business practice.

Enron has also shown that we must question just how independent advisors and auditors really are. Truly independent external auditors have a key role to play in the trading arena to help ensure that shareholders are notified if companies overstep the mark. Shareholders can then make an informed decision as to whether to support the company. Ultimately, it is up to the owners, the shareholders, to ensure that their interests are being served correctly by an auditor. At Enron, shareholders were blinded by massive returns on their shares, with the share price moving from around US$20 per share in the early '90s to a peak of around US$90 per share in 2001. In the case of Barings Bank, management did not hear the concerns and questions raised by the British Treasury about the large amounts of money being sent to Barings Singapore, as they were blinded by the huge profits they believed were being made by Nick Leeson. It would seem that a pattern is emerging here. A lot of people rode on the success of Enron, and many questions were not asked because they did not want to rock the boat.

But it is also important for management to create a balance. Excessive controls can lead to an oppressive control culture, which in turn can inhibit new ideas and creative thinking. It is not easy to create the right balance. However, it seems that some basic truths have emerged. When a firm starts to produce 250% increases in revenues (as was the case at times for Enron) or when it starts to create massive profits from a small division in an overseas subsidiary (as in the case of Barings), questions have to be asked.

In the Enron case, questions have been raised about the role of Andersen as both consultant and auditor. To restore shareholder confidence over financial statements, management could ensure external auditing activities are carried out by firms not serving the company in other ways that may create a perception of conflicts of interest. In the case of risk-management using derivatives, if financial auditors do not have the expertise, a specialist external risk-management auditing firm could be employed to review mark-to-market methodologies and to highlight any shortcomings of these methodologies that may create potential risks for the organization.

Since the collapse of Enron, politicians and regulatory bodies have been calling for senior management of organizations to be far more accountable if things go wrong. It is now more important than ever to have regular risk-management reviews and an open culture where people can question what the company is doing and how it is doing it. Firms should also foster a culture where management is seen to be receptive to well-founded and constructive criticism as well as new ideas from staff.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 11

Derivatives Controls & Usage Statement and Control Infrastructure

Problems surrounding the use of derivatives in recent years often revolved around difficulty in understanding their inherent risks and their use for risk-management purposes. These problems highlight the need for companies to develop internal control systems for their derivatives activities.

As discussed in earlier chapters, derivatives include a wide assortment of financial contracts, including swaps, futures, forwards, options, caps, floors and collars, whose values are derived based on defined formulas. Other types of derivatives include contracts traded on regulated exchanges, as well as those traded in unregulated OTC markets, which incorporate individually tailored contracts negotiated for a specific purpose.

The use of derivatives may control the price risks against which you wish to protect your business or of which, as a speculator, you wish to take advantage. However, such usage can increase other risks.

The risks associated with derivatives include the technical risks described in earlier chapters. In addition, there is the fundamental risk that the use of these products may not be consistent with entity-wide objectives. Derivative use is sometimes misunderstood because an instrument may be used to increase, modify or decrease risk, depending on the type and terms of the particular instrument. As contracts become increasingly complex, the value and effectiveness of a derivative in achieving objectives may become more difficult to ascertain before such positions are closed out or settled for cash.

Derivative products and activities must be well understood if control systems are to provide adequate assurance that their use will support the achievement of entity-wide strategies and objectives.

This is why a clearly worded, written, derivatives-usage and general risk-management policy, approved at board level, is very important. A derivatives-usage statement, which is often now reported in company annual accounts and reports (refer to British Petroleum or Shell published accounts, for example), is part of a sound risk-management culture.

This chapter is dedicated to outlining the risk-management process, some suggestions for the key elements of such a policy, and questions to ask and data to collect that may help in its formulation.

Important note: Policies that document the risk-management processes and provide for the use of derivatives should be carefully constructed to recognize that risk management means different things to different people.

Precise reasons for using derivatives are not always apparent, and risk relating to certain activities and uses may be interpreted differently.

Since there are no standard definitions of what risk-management activities entail, appropriate control means that entities must use very specific language to describe expectations for using derivatives for such purposes.

Policies should identify objectives and expected results, define terms and limits clearly, and identify and classify activities and strategies that are permitted, prohibited, or require specific approval.

THE RISK MANAGEMENT PROCESS

The primary components of a sound risk-management process are:

- A comprehensive risk-measurement approach
- A detailed structure of derivative position limits
- Clear guidelines to govern risk taken by officers of the organization
- A strong information system for controlling, monitoring and reporting risk.

These components are fundamental to both derivatives and non-derivatives activities. The underlying risks associated with derivatives activities, such as credit, market, liquidity, operations and legal risk, are not unique to the energy trading sector, but their measurement and their management can be more complex than physical energy deals.

As with all risk-bearing activities, the risk an organization takes in its derivatives activities should be properly supported by adequate working capital. The organization should also ensure that its capital base is sufficiently strong to support all derivatives risks on a fully consolidated basis and that adequate capital is maintained in all group entities engaged in these activities. This is even more important if its subsidiaries or any of its affiliates are "Specified Entities" in any of its ISDA agreements. Any default, perhaps on a loan or on a derivatives contract payment from one of its group companies, could affect its own trading position in the markets and see counterparties closing out its positions.

An organization's system for measuring the various risks of derivatives activities should be both comprehensive and accurate. Below are some of the key points to keep in mind:

- Risk should be measured and aggregated across all derivatives activities.
- A system that enables management to assess exposures on a consolidated basis should be in place.
- The risk-measurement system used (for example, value-at-risk) should be good enough to reflect accurately the multiple types of risks facing the organization.
- Risk-measurement standards should be understood by relevant personnel at all levels of the organization — from individual traders to the board of directors — and should provide a common framework for limiting and monitoring risk-taking activities.
- The process of marking derivatives positions to market (for fair-value accounting and management-control purposes) is fundamental to measuring and reporting exposures accurately.
- Any organization speculating in energy OTC derivatives and other traded derivatives should have the ability to monitor credit exposures, physical and derivative trading positions, and market-price movements on a daily basis.

As we saw in Chapter 8, stress testing derivative positions should also be included in any risk-management policy. VaR can be a good system for clearly illustrating the U.S.-dollar risk an organization may take overnight within a certain level of confidence. However, VaR only predicts a possible reality and doesn't show exactly what that reality will be. For this reason, it is prudent to use stress testing alongside a VaR system. This should be conducted on a regular basis to assess the impact on the organization should a disaster occur. For example, if there were a large standard deviation move from normal market situations (perhaps a three standard deviation move) would the organization survive the cash-flow crunch? In the oil industry, the Gulf War period in the early 1990s provides a good real-life scenario to run through a system using historical data.

Sound risk-measurement practices should include identifying possible events or changes in market behavior that could have unfavorable effects, and assessing the institution's ability to withstand them. These analyses should consider not only the probability of an adverse event but also "worst case" scenarios. It should also be noted that these same reports can help management and accounts departments to write up derivatives disclosures, in line with more recent accounting requirements (see Chapter 17).

Ideally, such worst-case analysis should be conducted on a group-wide basis by taking into account the effect of unusual changes in prices and or volatilities. It should also look at various "What if?" scenarios of market liquidity and early-termination events under ISDA OTC derivatives arising from a key default of a large counterparty. This scenario should include input from the organization's legal department to ensure that contingency plans for disaster scenarios are understood fully by all line managers.

For a risk-management process to be complete, these regular stress tests should not be limited to quantitative computation of potential losses or gains. They should include more qualitative analyses of the action plan that management might take under particular "disaster" scenarios.

It is certainly better for both management and traders to have a written policy for guidance in such scenarios. This can be used to develop contingency guidelines and plans outlining operating procedures and lines of communication, both formal and informal. If something bad happens, the panic that follows could cost more in lost reputation and money than the original problem. However, with forethought and contingency planning it is possible to bring some calm to such a situation. Even if the contingency plans don't exactly meet the demands of the specific situation, they will focus everyone's attention on resolving the issue, rather than allowing the problem to get worse.

TRADING CONTROLS — POSITION LIMITS

A sound system of integrated limits and risk-taking guidelines is essential for the risk-management process. This is the first line of defense against internal fraud, as well as enabling position control, risk-management reporting and subsequent action plans by management and traders alike. The system may require a big investment of both human resources and cash, but it will pay for itself many times over, especially if it is implemented from the start of derivatives trading.

Such a trading/position-limit system should set boundaries for organizational risk-taking and risk-reduction through hedging and should also ensure that positions that exceed predetermined levels receive prompt management attention. Any breach of position control should trigger what is termed an "exception report", which management should review on at least a daily basis. The system should be consistent with the effectiveness of the organization's overall risk-management process and with the adequacy of its capital position. Just because an organization is hedging rather than speculating does not mean that position controls are not needed. It is important for management to ensure that the extent of hedging is within board-approved remits and policy. If position limits are breached, such occurrences should be made known to senior management and the position should be reduced immediately or the larger position approved by authorized personnel.

Position limits are not restricted to the size of a position; they also include the types of derivatives used and the choice of energy products in which derivatives can be used. Clear details should be written into the risk-management policy and made available to traders so they know which derivatives they can use, and for hedging which risks. If the organization is also speculating, the policy should detail the size limits of positions based on tenure (how far forward). The organization may say, for example, that a trader can trade Naphtha Swaps up to six months forward but no further because of liquidity concerns.

Position limits

- By energy product/type — for example, Dubai crude, U.K. NBP Gas, Singapore Gasoil 0.5%, New York Harbor Unleaded Gasoline
- By type of derivative — swaps, futures, options, exotic options
- By tenure — how big a position can be put on and how far forward (Dubai Crude swaps two million barrels, one–six months forward and one million barrels seven–12 months forward)
- By division or office
- By individual trader
- By group of offices/divisions (depending on size of operation)

An accurate and timely management-information system is essential to the proper operation of derivatives activities; and the more real-time it is, the better.

In speculative trading operations, there should be reports across all markets on the gross and net exposures broken down by energy market and counterparty, showing the net position on each market and the overall VaR or other risk-measurement results. This report, together with profit-and-loss statements, should be reported at least daily to managers not active in trading (that is, those who supervise but who do not themselves conduct trading activities) to ensure an adequate segregation of duties.

End-users who are using derivatives infrequently for long-term hedging are still advised to generate profit-and-loss statements (that is, fair-value marked-to-market calculations of their hedge against underlying energy-market exposure) to ensure that their hedge is effective and how it is performing on a daily basis. Any other position and disaster-scenario reporting may not be necessary. However, it is up to the management to make a final decision as to the appropriate level of reporting required.

Reporting to senior management and the board may occur less frequently; but, whatever the frequency, these individuals should be given adequate information to assess the changing nature of their organization's risk profile. After all, they are ultimately responsible to shareholders if anything goes wrong. For companies using derivatives for hedging long-term energy exposures but which do not change their derivatives position frequently, quarterly reporting to the board is probably sufficient. If derivatives positions are being changed or added to more frequently, monthly reporting may be more prudent. Better still, implementing a computerized risk-management system will provide board members with a snapshot of the organization's derivatives, physical energy portfolio and risk profile at any given time. This should be backed up with a mandatory update at a specified interval.

Risk-management information systems should ideally translate the measured risk for derivatives activities (combined with physical-energy trading activity, if applicable) from a technical and quantitative format to one that can be easily read and understood by senior managers and directors. Value-at-risk methodologies can be very useful in this situation as, by their very nature, they present risk as a monetary value over a given time period within a certain percentage probability.

KEY GUIDELINES

The following is a list of guidelines for a risk-management policy and should be read in conjunction with Chapter 9. Although the list is not exhaustive, it captures both the spirit of what a risk-management policy should cover and the core contents of a policy for any organization, whatever its reasons for using derivatives.

- Approve risk-management policy at board level. This level of approval should include the scope of the organization's usage of derivatives and the general policies to be applied.
- Value derivatives positions on a daily basis at fair value/market value, at least for risk-management reporting purposes.
- Quantify the organization's market risk under adverse market conditions against limits, by performing stress-testing simulations.
- Assess the credit risk arising from derivatives activities based on frequent measures of current and potential exposure against credit limits and counterparties. Is there too much exposure to any single counterparty? Is there a credit-risk mitigation and control policy? Can the organization utilize credit derivatives or credit insurance?
- Don't become involved in a product at significant levels until senior management and all relevant personnel (including those in risk management, internal control, legal, accounting and auditing) understand the product and are able to integrate it into the organization's risk-measurement and control systems.
- Reduce credit risk by broadening the use of multi-product master agreements with netting provisions.
- Establish market and credit-risk management functions with clear authority, independent of the front-office derivatives-trading function (that is, a clear segregation of duties).
- Authorize only professionals with the required skills and experience to transact and manage the energy risks, and to process, report, control and audit derivatives activities.
- Establish management-information systems sophisticated enough to measure, manage and report the risks attached to the derivatives used.
- Adopt fair-value accounting and disclosure practices (for example, FAS 133 or IAS 39).
- Value dealers' derivatives portfolios based on mid-market levels minus specific adjustments, or on appropriate bid or offer levels.

Mid-market valuation adjustments should allow for expected future costs such as unearned credit spread, close-out costs, investing and funding costs, and administrative costs.

- Once a method of risk measurement is in place, market-risk limits must be based on factors such as management tolerance for low-probability extreme losses as opposed to higher-probability modest losses; capital resources; market liquidity; expected profitability; trader experience and business strategy.
- Use a consistent measure to calculate the market risk of derivatives positions on a daily basis and measure it against the established market-risk limits. Market risk is best measured as VaR, using probability analysis based upon a common confidence interval (for example, two standard deviations) and time horizon (for example, a one-day exposure).
- Dealers should perform regular simulations to determine how their portfolios would perform under stress conditions. They should have a market-risk management function, with clear independence and authority.
- Stress testing should be included in any sound risk-management policy. These simulations should reflect both historical events and future possibilities and should include not only abnormally large market swings but also periods of prolonged inactivity. The tests should consider the effect of price changes on the mid-market value of the portfolio, as well as changes in the assumptions about the adjustments to mid-market (such as the impact that decreased liquidity would have on close-out costs). Dealers should evaluate the results of stress tests and develop contingency plans.
- Dealers should periodically forecast the cash-investment and funding requirements arising from their derivatives portfolios. The frequency and precision of forecasts should be determined by the size and nature of mismatches. A detailed forecast should determine surpluses and funding needs by currency, over time. It should also examine the potential impact of contractual unwind provisions or other credit provisions that produce cash or collateral receipts or payments. There have been instances of currency problems for hedgers using derivatives. One highly publicized case in the late '90s was that of Korean Airlines, which hedged jet fuel using U.S.-dollar-denominated swaps. However, the core cash flow of the company was in Korean won. Unfortunately, the currency rate moved dramatically and Korean Airlines wound up with compounded losses via forex

risk on derivatives hedges as it had to buy additional U.S. dollars at a bad exchange rate to meet settlements on maturing jet-fuel swaps.

- Independent risk managers should ensure that appropriate risk-limit policies are developed and that all transactions and positions are monitored for adherence to these policies. They should also design stress scenarios to measure the impact of market conditions, however improbable, that might cause market gaps, volatility swings, or disruptions of major relationships, or might reduce liquidity. Any variance between the actual volatility of the portfolio value and that predicted by the measure of market risk (for example, VaR) should also be monitored.

  The risk manager should also be responsible for the review and approval of pricing models and valuation systems used by front- and back-office personnel, and the development of reconciliation procedures, if different systems are used.
- Organizations are advised to set up a market-risk management function. This is usually headed by a board-level executive. The market-risk manager, who is rarely involved in actual risk-taking decisions, should act as a catalyst for the development of sound market-risk management systems and procedures. The manager should review trading performance by deciding whether results are consistent with those suggested by an analysis of value-at-risk (or whatever the risk measure employed). End-users could have someone on the board who is trained in derivatives and who can question the success of risk-management or trading programs.
- End-users should adopt (as appropriate to the nature, size and complexity of their derivatives activities) the same valuation and market-risk management practices that are recommended for speculative traders. Specifically, they should consider regularly marking to market their derivatives transactions for risk-management purposes; periodically forecasting the cash investing and funding requirements arising from their derivatives transactions; and establishing a clearly independent and authoritative function to design and assure adherence to position and/or risk limits set by the organization.
- Most end-users may not expect any significant change in the combined value of their derivatives positions and the underlying energy exposure, as they are hedging an underlying or future exposure to energy price. But even if this is the case, they should establish hedge performance assessment and derivatives/management control procedures that are appropriate to their activities.

- Speculative traders and end-users who hedge using derivatives should measure both their current exposure, which is the replacement cost (the market value) of derivatives transactions, and potential exposure, which is an estimate of the future replacement cost of their derivatives transactions. This should be calculated using probability analysis based upon broad confidence intervals (say, two standard deviations) over the remaining terms of the transactions. This will enable them to calculate the current and future replacement costs of derivatives should a counterparty default now or in the future.
- Any credit risk on derivatives, and all other credit exposures to a single counterparty, should be aggregated, taking into consideration any enforceable netting arrangements. Credit exposures should be calculated regularly and compared to credit limits. In calculating the current credit exposure for a portfolio of transactions with a counterparty, the first question is whether netting applies. If it does, the current exposure is simply the sum of positive and negative exposures on transactions in the portfolio. Though master netting agreements which cover both physical energy and derivatives positions are still in the early stages of development, they are possible. More common are the netting agreements for derivatives within ISDA master agreements.
- Traders and end-users of derivatives should have an independent credit-risk management function that has analytical capabilities in derivatives. This would be responsible for approving standards for measuring credit exposure; setting credit limits and monitoring their use; reviewing credits and concentrations of credit risk with counterparties; and reviewing and monitoring risk-reduction arrangements and working with legal departments or lawyers to check their enforceability (this may vary, depending on the jurisdiction of the counterparty).
- The credit-risk management function should continually review the creditworthiness of counterparties and their credit limits. Traders and end-users should have a policy to use one master agreement as widely as possible to document existing and future derivatives transactions. Master agreements should provide for the netting of payments and close-out netting, using a full two-way payments approach.
- All users of derivatives should have a clear policy on credit-risk reduction arrangements that can be useful in the management of counterparty credit risk. These should include collateral and

margin arrangements, and third-party credit enhancement such as guarantees or letters of credit.

- Organizations using derivatives must ensure that their derivatives activities are undertaken by professionals in sufficient numbers (to reduce operational risk via dependence on single individuals) and with the appropriate experience, skill levels, and degrees of specialization. These professionals should include specialists who transact and manage the risks involved, their supervisors, and those responsible for processing, reporting, controlling and auditing the activities.
- The financial statements of derivatives users should contain sufficient information to explain why such transactions have been undertaken, the extent of the transactions (in which markets and the volume transacted) and the degree of risk involved or, if hedging, how much this activity aims to reduce the organization's overall risk. It should also set out how the transactions have been accounted for (that is, the accounting standard adopted).
- Know the market; have a policy for assessing new derivatives markets and whether they are appropriate for the organization's trading or risk-management needs. (Is the proposed new market appropriate? Does it offer effective hedges? What are the liquidity issues? Who are the main participants? Are there any credit issues with these potential counterparties?)

CHAPTER 12

OTC Derivatives Legal Documentation

THE ISDA MASTER

In January 2003, the International Swaps and Derivatives Association (ISDA) — the global trade association that represents leading participants in the privately negotiated derivatives industry — launched the new version of its Master Agreement. The product of several months' consultation and amendment, the 2002 Master Agreement (ISDA 2002) built upon and amended many of the provisions of its predecessor, the 1992 Master Agreement (Multicurrency Cross-border version) (ISDA 1992), which revolutionized the documentation and legal contract process surrounding swaps trading across all markets, including energy.

As of the first half of 2007, more than US$300 trillion of OTC derivatives were being held under the terms and conditions of an ISDA Master swaps agreement. Besides its use in commodity markets such as energy markets, the 2002 ISDA Master agreement is being used as a legal framework for emissions trading, with the addition of the relevant "emission trading schedule" to the agreement put in place with counterparties.

ISDA's agenda from 2007 onwards is to focus on meeting the documentation and policy needs of its members as new commodities are traded, as financial innovation continues and as capital continues to flow into the sector. ISDA's Documentation Committee (ISDA-DC) has made public it intend to offer market participants alternative ways to manage physical and financial commodity risks more efficiently under new commodity-specific documentation and to open up the sector to new and different investors by encouraging broader market participation.

Since 2006, ISDA-DC has been focusing on meeting the changing needs of commodity market participants by considering a number of diverse documentation projects. These include confirmation templates for transactions on commodity indices and commodity baskets; an annex to the ISDA Master Agreement for physical refined products and/or crude oil; and developing terms for trading carbon-emissions reductions in the European Union and renewable-energy credits in the United States. In December 2006, ISDA published a U.S. Emissions Allowance Transaction Annex to the ISDA Master Agreement, together with a trade confirmation template, in response to demand from members for standardized terms for trading emissions.

On a related topic, in September 2006, ISDA published Version 3 of the ISDA EU Emissions Transaction Document, which, among other things, adds provisions for financially and physically settled options and forwards in European emission markets.

THE ISDA AGREEMENTS

ISDA agreements are made up of two important parts: the ISDA Master Agreement, a standard format which does not change, and the ISDA Schedule to the Master Agreement, which is negotiated between counterparties. This contains information such as procedures on settlement, early termination, default, netting arrangements and banking details for each of the parties to the Master Agreement.

The majority of crude oil, petroleum products, and financial power and gas OTC derivatives (that is, derivatives that are money settled and do not involve physical delivery of the commodity) use the 1992 ISDA Master Swaps Agreement Multi-currency Cross-border version. Counterparties in the market generally use this Master Swaps agreement with 1993 ISDA Commodity Derivatives definitions and the 2000 supplement to the 1993 ISDA Commodity Derivatives definitions.

THE ISDA MASTER AGREEMENT

An ISDA Agreement consists of 14 sections covering such areas as definitions, obligations, default and termination events, early termination, currency stipulations, and governing laws and jurisdictions.

USEFUL ISDA PUBLICATIONS

ISDA publishes some very useful books to help business managers understand the meanings of the contract sections of its agreements. These include:

1. ***2005 ISDA Commodity Derivatives Definitions***
The 2005 ISDA Commodity Definitions, together with a User's Guide to the definitions, were published in June 2005. The definitions are designed to facilitate the documentation of commodity transactions under the 2002 Master Agreements. Sample forms of confirmation are included.

2. ***Supplement to the 2005 ISDA Commodity Derivatives Definitions (May 2006)***
This new Commodity Reference Price was published in connection with a Best Practices Statement for Certain Energy Transactions (dated 12 May 2006 and available under the Energy, Commodities and Developing Products Committee webpage). The Statement relates to OTC derivatives transactions affected by the NYMEX's discontinuation of its New York Harbor Unleaded Gasoline ("HU") futures contract and ISDA's recommended replacement with the NYMEX reformulated gasoline blendstock for oxygen blending futures contract (RBOB).

3. ***Amendment Agreement to the ISDA Master Agreement and Letter Agreement relating to the 2005 ISDA Commodity Definitions***
These enable firms to substitute references to the 1993 ISDA Commodity Derivatives Definitions, to the 2000 ISDA Supplement to the 1993 ISDA Commodity Derivatives Definitions, and the 1997 ISDA Bullion Definitions with a reference in their Schedule or Confirmation to the 2005 ISDA Commodity Definitions. These documents are optional for parties to use as they deem appropriate.

ISDA DOCUMENTATION PROCESSING

When entering into an ISDA agreement, one of the parties will usually take the initiative and send its standard ISDA Schedule draft wording to the counterparty for review and comment.

Before negotiation begins on the specific terms of the Schedule, the credit department must first process the counterparty details and pass the details of internally approved credit terms to the legal department for inclusion in the ISDA Schedule; this also affects whether or not Credit Support Annexes are required.

Before rushing into the expense of processing legal documentation with a new OTC counterparty, it is useful to check the memorandum and articles of association (known as the "M&As") of that counterparty. These provide the legal incorporation details of the organization, specifying what business functions it can carry out and, sometimes, what it is prohibited from doing. It is very important to check that there is nothing to prevent it from entering into OTC derivative contracts. If the M&As are satisfactory, both parties should be ready to put together an ISDA agreement.

Although the ISDA Master Agreement is a standard document, there are areas which may give rise to different types of risk for counterparties and are therefore often areas for negotiation in the Schedule. These areas are as follows:

(The following notes refer to ISDA 1992, which is still a key agreement offered by energy counterparties at the time of writing.)

- **Legal Risk**

Section 1(b) Inconsistency — Where there is any inconsistency between the ISDA Master Agreement text and the ISDA Schedule, the Schedule will prevail. If there is any conflict between a Confirmation and the ISDA Master and the Schedule, the Confirmation will prevail. This can contribute to operational risk, so trade confirmations must be issued correctly.

Section 1(c) Single Agreement — If trades are closed out, this section ensures that the values of all trades between the counterparties are calculated and netted off against each other, so that only one payment is required. This prevents "cherry picking" where, in the event of a company going bankrupt, the liquidator can call in payments on trades that are profitable for the bankrupt client, but refuse to pay out on trades which are not profitable. For example, imagine that Counterparty A ("A") and Counterparty B ("B") negotiate two derivatives trades, with "A" making US$2 million on one deal (it's a zero-sum game, so "B" is losing US$2 million), and "B" making US$1.5 million on the other (with "A" losing US$ 1.5 million). In this situation, if "B" went bankrupt and Section 1(c) was not in place (because it had been deliberately excluded in the ISDA Schedule), then

"A" could be forced to pay US$1.5 million to "B", even though the net position is that "B" owes "A" US$500,000. The single-agreement concept reinforces the position that this cannot be done, and the liquidator collapses and nets out the entire portfolio of derivatives trades into one single payment due to one counterparty or the other.

Section 5(a) **Events of Default** — A key area, this covers a party's failure to make any payment or delivery under Section 2 of the Master Agreement. In the past, the energy industry adopted a three-day grace period, but this is increasingly being shortened to just one day. This section also covers credit-support default, misrepresentation, default under specified transactions, cross default, bankruptcy, merger, illegality and credit event upon merger.

Section 7 **Transfer of the Agreement** — Normally, counterparties are not allowed to transfer the ISDA Agreement or any rights and obligations under it without written consent from the other party. There are a few exceptions to this rule but these are rare instances where one party wants to transfer the agreement to avoid an "event" (for example, illegality, a tax event, or certain cases surrounding a merger) and transfers the close-out money payable to it by the defaulting counterparty to another firm.

Section 8 **Contractual Currency** — This states what currency is being used in the contract and, therefore, the currency that is expected to be used for all settlement and close-out payments.

Section 9(d) **Miscellaneous (Remedies Cumulative)** — When one party is faced with the counterparty's default, the termination of derivatives trades is not the only course of action. It can leave the trades open or even sue for damages, if it chooses to do so.

Section 13 **Governing Law and Jurisdiction** — The majority of energy derivatives trades under ISDA outside the United States, even with American companies, are conducted under English Law and the jurisdiction of the English courts. Under ISDA, there is a choice between English Law and English Courts or State of New York Law and the jurisdiction of the courts of the State of New York and the U.S. District Court located in the Borough of Manhattan in New York.

- **Counterparty Risk**

Section 5 **Events of Default and Termination Events** — This is examined from a practical standpoint in the ISDA Schedule example later in this chapter.

- **Market Risk**

Section 6 **Early Termination of Contract** — This covers the process to be followed given an early termination of the contract, especially with an Automatic Early Termination which might be triggered through default on a payment due under swaps contracts.

- **Documentation Risk**

Section 4 **Agreements** — This section covers the documents which the counterparties agree to provide one another (for example, certificates of incorporation, copies of licenses and renewals). It also covers agreement that in some cases counterparties must maintain certain licenses and pay any stamp duty taxes required on agreements, and so on.

- **Payment on Settlement Risk**

Section 2 **Payment & Delivery Obligations** — This key area covers details of how payments are to be made, how netting is performed and the provisions protecting counterparties against withholding tax deductions.

TRADING BEFORE AN ISDA IS SIGNED

There is a documentation risk in the time period between the execution of an OTC derivatives trade and an agreement being agreed upon and signed. If a trade does take place prior to an ISDA being signed between the two counterparties (which is not advisable unless there are considerable commercial pressures to put a hedge on very quickly) then the Trade Confirmation sent out will normally state that both parties to the deal must use "best endeavors" to enter into such an agreement. The Confirmation usually states that the derivatives trade is subject to the terms of an ISDA Master Agreement without a Schedule; that is, that it is basically unamended.

The lack of a Schedule, though, means that the counterparties cannot make their own choices over key issues in the Master Agreement. These issues include choices over what triggers automatic early termination of derivatives deals; payment netting and methods; what happens if one of the counterparties merges with another; termination currency; tax representations (regarding withholding taxes on settlement payments); credit support (any parent companies willing to support the credit exposure on the derivatives trades); and which entities are included in Specified Entities (the other companies that are included in the agreement for the purposes of triggering a default).

The biggest risk for any organization trading without an ISDA Agreement is that counterparty bankruptcy or liquidation could lead to the liquidator "cherry picking" any profitable deals.

ISDA MASTER AGREEMENT SCHEDULE

The ISDA Master Agreement Schedule states which sections of the Master Agreement will be in force between the two parties to the agreement and is thus often the center of much discussion and negotiation. Although ISDA Schedules will differ slightly from one another in commercial terms, there are key parts that turn up again and again.

The ISDA Schedule is always executed (signed off) on the same date as the Master Agreement to which it refers. If an organization updates a Master Agreement Schedule at a later date and has some OTC derivatives currently outstanding under the old agreement, it is common practice for energy-trading companies to backdate the new Schedule agreement so that old transactions are covered by the updated Schedule.

The Schedule is made up of the following core sections:

- Termination Provisions
- Tax Representations
- Agreement to Deliver Documents
- Miscellaneous
- Other Provisions.

Step-by-step explanation of a typical ISDA 1992 Master Agreement Schedule between a trader and a bank

Agreement dated 26 June 2004

Between

COREX Trading Limited (Party A)

and

XYZ Bank Limited (Party B)

[The Schedule names the counterparties to the agreement; that is, the two organizations (or groups) that want to trade with one another]

PART 1

TERMINATION

In this Agreement:

1. "Specified Entity" means in relation to Party A for the purpose of:
   Section 5(a)(v): [Default under specified transactions]
   Section 5(a)(vi): [Cross Default]
   Section 5(a)(vii): [Bankruptcy]
   Section 5(b)(iv): [Termination event — credit event upon merger]

   "Specified Entity" means in relation to Party B for the purpose of:
   Section 5(a)(v): Not applicable
   Section 5(a)(vi): Not applicable
   Section 5(a)(vii): Not applicable
   Section 5(b)(iv): Not applicable

[This is about Party B getting as much credit cover as possible against Party A in the event of a default. In this example, under Section 5, XYZ Bank does not have to give these assurances back to COREX. COREX, though, is agreeing that if it defaults on any OTC contract with the bank, XYZ has the right to close out all transactions under this agreement. Note that COREX's Credit Support providers (for example, its parent company) are automatically joined to this provision in ISDA 1992.

The aim of the Specified Entity provision is to draw in those organizations whose capital is closely correlated with that of COREX Trading. Banks rarely offer this provision because most of the assets of its group will be in the bank itself and they see little point in opening themselves to the risk of a company such as COREX closing out trades through the default of, say, one of its small subsidiaries under another agreement with COREX or one of its specified entities.]

2. "Specified Transaction" will have the meaning specified in Section 14 of this Agreement.

[Section 14 in the Master Agreement — unless it states otherwise, which in this example it does not — refers to any OTC derivative transaction existing in another agreement between the parties to this Schedule or their affiliates or specified entities. The bottom line is, if COREX has lots of swaps and OTC options positions with XYZ, and a COREX subsidiary, EFG Trader, enters into a swap agreement with XYZ and then goes bankrupt and defaults, under that agreement XYZ could go back and close out COREX's positions.

3. "Cross Default": The provisions of Section 5(a)(vi) will apply to Party A and Party B.

[This provision catches contractual terms and payment defaults in relation to borrowed money in agreements between the two parties to this ISDA Agreement and their Specified Entities or Credit Support Providers with any third party. Such a default has to exceed a defined limit, termed the Threshold Amount. This means that if COREX or any of the companies in its group, or any company that is providing Credit Support in this agreement to permit trading between COREX and XYZ, defaults on any agreement under which it has borrowed money, then XYZ Bank can close out the transactions under this Agreement.]

"Specified Indebtedness" will have the meaning specified in Section 14 of this Agreement except that (i) such term shall not include obligations in respect of deposits received in the ordinary course of a party's banking business and (ii) there shall be added at the end thereof "or any money otherwise raised whether by means of issue of notes, bonds, commercial paper, certificates of deposit or other debt instruments, under financial leases, deferred purchase schemes or under any currency or interest rate swap or exchange agreement of any kind whatsoever or otherwise."

[In this Schedule, XYZ Bank Ltd is extending what the borrowing of money is related to to incorporate notes, bonds, commercial paper and so on. XYZ wants to protect itself against the higher risk of COREX, working on the notion that a default somewhere else in some loan or lease may be an early-warning sign of an impending bankruptcy. XYZ has the ability to close out its OTC positions and control its losses by excluding the banking deposits it may receive from its customers, which is quite common. Technically, these deposits are money borrowed by the bank from its customers, so some may argue over this. The usual problem faced by a bank is that its customers' deposits are very large and would easily breach any threshold amount level.]

"Threshold Amount" means with respect to Party A an amount of US$10,000,000 or the US Dollar equivalent of any obligations stated in any other currency, currency unit or combination thereof; with respect to Party B, an amount equal to 5% of stockholders equity as of the end of its most recently completed fiscal year (or its equivalent in any currency).

[The threshold amount is the amount of money or limit of specified indebtedness below which XYZ cannot trigger its close-out rights under this agreement's cross-default clause. In this case, for COREX, the limit is US$10 million. XYZ is a huge entity and its capital base can be very variable; so, instead of a fixed monetary amount, a formula based on a percentage of stockholders' equity is used. This is quite common for Wall Street refiners; that is, financial institutions trading in the energy derivatives markets]

4. "Credit Event Upon Merger": The provisions of Section 5(b)(iv) will apply to Party A and Party B as amended as follows:

Whether, for the purposes of Section 5(b)(iv) of this Agreement, the resulting, surviving or transferee entity (hereinafter "Y") is "materially weaker" shall be a matter to be determined in the reasonable discretion of the other party. Notwithstanding the foregoing, the creditworthiness of Y shall not be determined to be materially weaker if Y agrees to and does within two local Business Days of demand provide Eligible Credit Support (as defined in the Credit Support Annex) in an amount equal to or in excess of the Delivery Amount (as defined in the Credit Support Annex) on the basis that the Threshold for Y shall be zero notwithstanding anything to the contrary in the Credit Support Annex and thereafter maintains such Eligible Credit Support in accordance with the Credit Support Annex as amended by this provision.

[Sometimes, to avoid dispute, parties to an ISDA Schedule will be specific as to what "Materially weaker" actually means for the purposes of their agreement. For example, in this case it might define this as: "If either COREX Trading Ltd or XYZ Bank Ltd fails to maintain a long-term, unsecured and unsubordinated debt rating of at least BBB- as determined by Standard & Poor's Ratings Group, or Baa3 as determined by Moody's Investors Service Inc." These ratings are used because anything below these is generally considered non-investment grade or perhaps even junk-bond status. Terminology like this may be used in a Schedule between two large entities; perhaps two large banks. Enron almost certainly suffered as a result of OTC transactions being closed out when its rating was lowered, because others who had only put cover against default on a trade or borrowing of money in their schedule had to wait whilst they saw Enron going down fast but not defaulting on loans as banks tried to bail them out. Needless to say, what defines a "default" has been under great scrutiny in the world of OTC derivatives since Enron.]

A Credit Event shall also occur if:

(a) any person or entity acquires directly or indirectly the beneficial ownership of equity securities having the power to elect a majority of the board of directors of X, any Credit Support Provider of X or any applicable Specified Entity of X or otherwise acquires directly or indirectly the power to control their policy making decisions; or

(b) X, any Credit Support Provider of X or any applicable Specified Entity of X enters into any agreement providing for any of the Credit Events specified in Section 5(b)(iv) of the Agreement or in clause (a) above.

5. The "Automatic Early Termination" provision of Section 6(a) will apply to Party A and Party B.

[Automatic Early Termination has an impact on events of default on bankruptcy. The effect of this provision is that all transactions under the agreement are deemed terminated as of a date immediately before a winding-up order is presented against the defaulting party and immediately at the time bankruptcy proceedings are instituted against the defaulting party in all other cases. This means that the non-defaulting party can exercise its rights outside the insolvency proceedings. Parties choose to have this section included in a Schedule about 80% of the time. There are some countries, though, in which it is always advisable to use Section 6(a). A fully updated list of such countries is available from ISDA.]

6. Payments on Early Termination. For the purpose of Section 6(e) of this Agreement:

(i) The Market Quotation Method will apply.

(ii) The Loss Method will apply.

(iii) The Second Method will apply.

[In the energy markets there are three choices on how to calculate the amount owed between the counterparties in the event that contracts are terminated early and payment is required. The Market Quotation Method is very popular as it is simple to use for plain-vanilla instruments such as fixed or floating swaps, where there is typically good liquidity. It involves obtaining a series of usually three or four quotations from market makers (not brokers) for the replacement value of the derivatives to be terminated. If these are more complex than plain-vanilla swaps, there could be problems obtaining reasonable quotes from the market makers. In such circumstances, loss could be used as a fallback and put in the Schedule as a fallback provision. The Loss Method is the non-defaulting party's "good faith" determination of its losses and costs (minus its gains) in respect of replacing terminated transactions. Last but not least, the Second Method basically means the defaulting party has to pay anything it owes to the non-defaulting party, but if the non-defaulting party owes the defaulting party money it has no obligation to pay any amount to the defaulting party until it has received confirmation that all transactions have been terminated under this Schedule, and that all obligations (matured or otherwise) of the defaulting party or any of its affiliates to the non-defaulting party or any affiliate of the non-defaulting party have been met.]

7. "Termination Currency" means the currency selected by the party which is not the Defaulting Party or the Affected Party, as the case may be, or where there is more than one Affected Party the currency agreed by Party A and Party B. However, the Termination Currency shall be one of the currencies in which payments are required to be made in respect of Transactions. If the currency selected is not freely available, or where there are two Affected Parties and they cannot agree on a Termination Currency, the Termination Currency shall be United States Dollars.

[Simply, this is the currency into which all derivatives transactions are converted on close-out and settlement. Section 7 illustrates very common wording in ISDA Schedules. It allows the non-defaulting to choose the currency. If the currency chosen is not freely available for any reason then the Schedule defaults to U.S. dollars.]

8. "Additional Termination Event" shall apply as follows:

[Additional termination events include change of control, ratings downgrade (as in the Enron case), the death or resignation of key individuals (if the counterparty is a small entity or one controlled perhaps by key management), breaches of agreement, or sovereign events (perhaps the counterparty is based in a politically unstable region). The following example shows the wording for change of ownership and ratings downgrade.

Example of Change of ownership wording: "COREX Trading Limited either directly or indirectly ceases to own directly or indirectly 51% of the issued share capital of EFG Trader [its subsidiary] carrying voting rights in ordinary circumstances in a general meeting of shareholders or a comparable meeting of EFG Trader or otherwise directly or indirectly ceases to control the board of directors of EFG Trader and or EFG Trader ceases to be a fully consolidated subsidiary of COREX Trading Limited."

Downgrade: S&P or Moody's, or both, rate the long-term, unsecured, unsubordinated debt obligations of COREX Trading Ltd or XYZ Bank Ltd at least three modifiers (a modifier being 1, 2 or 3 for Moody's or plus, neutral, minus for S&P) lower than the highest rating which had previously applied (from the date of this agreement) to the long-term unsecured , unsubordinated debt obligations of COREX or XYZ Bank.

(i) COREX Trading or XYZ Bank ceases to be rated by both S&P and Moody's.

For the purposes of the foregoing Termination Event, the affected party shall be the party that was downgraded or ceased to be rated.

[This is self-explanatory: if the rating gets too badly affected, OTC derivatives contracts under this agreement can be terminated by the "Affected" party].

PART 2

TAX REPRESENTATIONS

[Tax representations are left over from the early years of OTC derivatives when there was uncertainty even in the United States as to whether a payer's tax authority would levy a withholding tax on settlement payments made on OTC swaps transactions. The ISDA agreement covers both counterparties against any withholding tax ever being required to be paid on any derivative settlements via Section 2(d) (i)(4) of the Master Agreement, which makes it the responsibility of the payer (the company sending the payment) to ensure that the payee (the company receiving the payment) gets full payment. The payer must gross up the payment to the payee so that the payee receives, after deduction of the payer's jurisdictional withholding tax, the full settlement required on the derivatives trade. I have only come across one such jurisdiction — Thailand — in which there was a clear withholding tax issue for energy derivatives. Any organization entering into an ISDA agreement with a new counterparty should obtain a legal opinion on the country through which they are going to be dealing.]

Payer tax representations

1. For the purpose of Section 3(e) of this Agreement, both parties make the following representation:

It is not required by any applicable law, as modified by the practice of any relevant governmental revenue authority, of any Relevant Jurisdiction to make any deduction or withholding for or on account of any Tax from any payment (other than interest under Section 2(e), 6(d)(ii) or 6(e) of this Agreement) to be made by it to the other party under this Agreement.

[Relevant jurisdiction in the ISDA Schedule refers to the payer's home jurisdiction, where the office actually executing the trades is based; the jurisdiction where it executed the Agreement; and the jurisdiction from which it makes payments, including settlement payments for any transactions under this agreement]

In making this representation, it may rely on:

(i) the accuracy of any representation made by the other party pursuant to Section 3(f) of this Agreement; and

(ii) the satisfaction of the agreement of the other party contained in Section 4(a)(i) or 4(a)(iii) and the accuracy and effectiveness of any document provided by the other party pursuant to Section 4(a)(i) or 4(a)(iii) of this Agreement; and

(iii) the satisfaction of the agreement of the other party contained in Section 4(d).

Provided that it shall not be a breach of this representation where reliance is placed on Clause (ii) and the other party does not deliver a form or document under Section 4(a)(iii) by reason of material prejudice to its legal or commercial position.

[The payer tax representation actually does not include default interest payments or any interest that could be charged due to an early termination payment. This section is standard, and there are a few jurisdictions where ISDA may not have been tested and some where overseas payment and/or tax regulations have been outpaced by the local adoption of derivatives instruments. Where it does not appear in an ISDA Schedule, it is always advisable to check it.]

Payee Tax Representations

2. For the purpose of Section 3(f), both parties make the following representation:

Each payment received or to be received by it in connection with this Agreement relates to the regular business operations of the party (and not to an investment of the party).

[This section is not always included because of the existence of many double tax treaties around the world which have income and interest provisions giving protection against withholding taxes.]

Other Representations

1. Each party represents and warrants to the other (which shall be deemed to be repeated by each party on each date on which a Transaction is entered into) that:

(a) There has been no material adverse change in its financial condition since the last day of the period covered by its most recently prepared audited financial statement and that "Accuracy of Specified Information" as provided for in Section 3(d) will apply to the financial information which a party is required to deliver to the other party under this Schedule.

(b) It is entering into this Agreement and each Transaction as principal (and not as agent or in any other capacity, fiduciary or otherwise).

2. Each party will be deemed to represent to the other party on the date on which it enters into a Transaction that (absent a written agreement between the parties that expressly imposes affirmative obligations to the contrary for that Transaction):

(a) Non-Reliance. It is acting for its own account, and it has made its own independent decisions to enter into that Transaction and as to whether that Transaction is appropriate or proper for it based upon its own judgment and upon advice from such advisers as it has deemed necessary. It is not relying on any communication (written or oral) of the other party as investment advice or as a recommendation to enter into that Transaction; it being understood that the information and explanations related to the terms and conditions of the Transaction shall not be considered investment advice or a recommendation to enter into that Transaction. No communication (written or oral) received from the other party shall be deemed to be an assurance or guarantee as to the expected results of that Transaction.

(b) Assessment and Understanding. It is capable of assessing the merits of and understanding (on its own behalf or through independent professional advice), and understands and accepts, the terms, conditions and risks of that Transaction. It is also capable of assuming, and assumes, the risks of that Transaction.

(c) Status of Parties. The other party is not acting as a fiduciary for or an adviser to it in respect of that Transaction.

3. Absence of Litigation. Section 3(c) of the Agreement is hereby amended by limiting the definition of “Affiliate” for the purposes of this representation to such Affiliates, if any, as may be a Specified Entity for purposes of Section 5(a)(v).

PART 3

DOCUMENTS TO BE DELIVERED

For the purpose of Section 4(a)(i) and (ii) of this Agreement each party agrees to delivery of the following documents, as applicable:

Party required to deliver Document	Form/Document/ Certificate	Date by which to be delivered	Covered by Section 3(d) Representation
Party A	A certified copy of a board resolution authorizing the execution, delivery and performance of this Agreement and each Confirmation executed hereunder together with the names, titles and specimen signatures of the persons entitled to execute this Agreement and each Confirmation executed hereunder.	On or before execution hereof and if any change in authority has occurred prior thereto, on or before the execution of each Confirmation.	Yes
Party A	In respect of each transaction an accepted Confirmation signed by an authorized signatory.	Within 24 hours of receipt of the relevant Confirmation from Party B.	Yes
Party A	A capacity certificate in the form attached to this Agreement as Appendix A.	On or before execution hereof.	Yes

[This is a standard list of documents often required by banks entering into an ISDA Agreement with a corporate entity before trading begins. It will also note which documents are exchanged after each derivatives trade/transaction. A certified copy of a board resolution authorizing execution of the agreement is very important, otherwise trade conducted may not be enforceable on one or both parties. This may take time, but it is worth waiting for/insisting on]

PART 4

MISCELLANEOUS PROVISIONS

[Don't be fooled by the term "Miscellaneous"; it is still important. In Part 4, parties set out their contact details for notices, mainly for administrative purposes].

1. Address for Notices. For the purpose of Section 12(a):
   Address for notices or communications to Party A:
   Attention:
   Telex No: Answerback:
   Facsimile No: Telephone No:
   Email:

   Address for notices or communications to Party B:
   Address:
   Attention:
   Telex No:
   Facsimile No: Telephone No:

2. Process Agent. For the purpose of Section 13(c):

[A process agent will usually need to be appointed if a party is not incorporated in England, if the ISDA is under English Law (which is the preferred industry norm for the majority of OTC energy contracts outside the United States) or not incorporated in New York for a New York Law-based agreement. If a party does not have an office or is not incorporated in these jurisdictions, it will need to nominate an organization or lawyer in London or New York as a process agent to act on its behalf to receive writs, termination notices or other legal documentation associated with the ISDA agreement.]

Party A appoints as its Process Agent:
Party B appoints as its Process Agent:

3. Offices. The provision of Section 10(a) will not apply.

[Section 10(a) provides that if one of the companies signing this Schedule enters into a derivatives trade through one of its branches, its obligations will be the same as if it had executed the trade through its Head Office.]

4. Multi-branch Party. For the purpose of Section 10(c):

[If Section 10c applied, it would mean that both companies signing this Schedule were effectively providing an implied payment guarantee for any derivatives trades that their branch offices entered into. The benefit of being multi-branch is that an organization, via one ISDA agreement with its head office, can permit all of its branches to trade with the other counterparty.

It might read something like this:

"(d) Multi-branch Party. For the purposes of Section 10(c) of this agreement: Party A is a multi-branch and may act through the following offices: Tokyo, Singapore, Frankfurt, London, New York, Houston."

Party B can also put down whether it wants to make use of the multi-branch clause.]

5. Calculation Agent. The Calculation Agent is Party B, unless otherwise specified in a Confirmation in relation to the relevant Transaction.

[This is the counterparty in the agreement that has to determine the floating-rate values and calculate payments. It is usual for a financial institutional trader such as a bank to insist that it is the calculation agent where the agreement is with a corporate hedger or non-financial institution trader. Whoever is not the calculation agent will always have to double-check the calculation agent's figures and can dispute any big differences. Most of the time, with Platts price-related energy derivatives, differences can arise from the calculation agent simply not picking up on a change in the Platts price for a particular day, as the correction of the price may have been published much later in the contract month. If the counterparties cannot agree on which will be the calculation agent, they can agree to be co-calculation agents. The calculation agent also has to establish whether a "market disruption event" has occurred and remedy it. (See point 12 under Section 5)]

6. Credit Support Document. Details of any Credit Support Document:

   In respect of Party A: Parental Guarantee dated 10 December 2002

   In respect of Party B: Not applicable

[This is where any form of unconditional and irrevocable credit support against derivatives transactions under this ISDA Schedule is specified. For example, in OTC energy swaps, the majority of companies utilize "irrevocable standby letters of credit (LCs)" from a bank, "bank guarantee" or, less often, parental guarantees from their parent holding company. In this example, Party A, COREX Trading, is offering a parental guarantee from its parent, Mega Corporation.]

7. Credit Support Provider

Credit Support Provider means in relation to Party A:

[In our example, this would be Mega Corporation, which is offering the parental guarantee noted above.]

Credit Support Provider means in relation to Party B: Not applicable

8. Governing Law. This Agreement will be governed by and construed in accordance with the laws of England.

[As mentioned earlier, the two key laws and jurisdictions used are English and New York State. Any other jurisdictions should be avoided unless an organization is prepared to obtain legal advice that the new jurisdiction's law will not have an adverse impact on ISDA provisions and the Master Agreement. ISDA contracts are already well tested under English and New York State law. Where an ISDA Schedule is under New York Law, paragraph 8 would read "This Agreement will be governed by and construed in accordance with the laws of the State of New York (without reference to choice of law doctrine)"]

9. Netting of Payments. Subparagraph (ii) of Section 2(c) of the Agreement will not apply to all Transactions under this Agreement starting from the date of this Agreement.

[This provision is where the counterparties choose the scope of payment netting to be applied to the agreement. The wording that is chosen is often limited by how advanced their risk-management systems are. An organization should not feel pressured into any complex netting-of-payment wordings. Organizations should liaise with their back office to ensure systems can automate the netting required or, if not, that they are prepared to allocate human resources to process it.

The wording in this example is the standard chosen by default by the majority of banks and traders in the energy derivatives arena.

When Subparagraph (ii) of Section (c) applies, it means that "Single Transaction Netting" (same product, same currency, and same value date) applies.

This means that the two parties to this Schedule do not have to make payments to each other, but the one who owes the most money has to pay the difference between the two amounts to the other counterparty.

The other choices organizations can make on payment/settlement netting are:

- Cross-product netting: For more than one derivatives trade, for different products, in the same currency and due for payment on the same date.

- Multiple transaction netting: For more than one derivatives trade of the same type, in the same currency and due for payment on the same date.

If an organization wants to leave its options open, starting with the simplest form of netting and then, if it can handle it operationally later on, move on to more complex netting, it could agree with its counterparty on the following wording:

"Netting of Payments. (i) Subparagraph (ii) of Section 2 (c) will apply to all transactions under this agreement unless otherwise specified in a Confirmation in relation to the relevant transaction."]

PART 5

OTHER PROVISIONS

The following changes are made to this Agreement:

1. Definitions. This Agreement incorporates, and is subject to and governed by, unless otherwise specified in a Confirmation, the 2000 ISDA Definitions published by the International Swaps and Derivatives Association, Inc. (the "2000 Definitions") and the 1993 ISDA Commodity Derivatives Definitions ("1993 Definitions"). In the event of any inconsistency between the provisions of this Agreement and the 2000 Definitions and/or the 1993 Definitions, this Agreement will prevail. In the event of any inconsistency between the provisions of the 2000 Definitions and the 1993 Definitions, the 1993 Definitions will prevail. In the event of any inconsistency between the provisions

of any Confirmation and this Agreement or the 2000 Definitions or the 1993 Definitions, such Confirmation will prevail for the purpose of the relevant Transaction. In the event of any inconsistency between the provisions of this Schedule and the Agreement this Schedule shall prevail.

[In this example, the Schedule operates under the 2000 definitions and the 1993 ISDA Commodity Derivatives provisions which covers energy OTC derivatives transactions/trades.]

2. Change of Account. At the end of Section 2(b) add the following words:

"provided that, if any new account of the notifying party is not in the same jurisdiction as the original account, the other party shall not be obliged to pay any greater amount and shall not receive any lesser amount as a result of such change than would have been the case if such change had not taken place."

[Under an ISDA Master Agreement, the parties can give each other five local business days' notice of a change of their banking account details for payments. The reason this paragraph has been included here is to protect either party from potential withholding tax charges and foreign-exchange controls that might arise from the counterparty moving its bank account to another jurisdiction.]

3. Pari Passu. Party A hereby agrees that it will ensure that its payment and delivery obligations under this Agreement rank at all times at least pari passu in all respects with all of its other unsecured and unsubordinated obligations (except for those which are mandatorily preferred by operation of law).

[In our example XYZ Bank is getting COREX Trading to ensure that any unsecured debt it owes to XYZ Bank through settlement payments due on trades under this ISDA contract will rank equally with other unsecured and unsubordinated obligations in any winding up (liquidation) of COREX. It is very important for corporates to understand this clause as it can only be given if it is true. Advice should be taken on this clause if it turns up in a Schedule being proposed by a counterparty.]

4. Confirmations. Each confirmation shall be in the standard form used by Party B from time to time or in such other form as the parties

may agree. With respect to each Transaction, Party B shall on, or promptly after the Trade Date, send Party A a Confirmation. Party A shall promptly sign and return a copy of the Confirmation or advise any discrepancy between the Confirmation and Party A's own records whereupon the parties will promptly agree on the text of a replacement Confirmation for signature by Party A.

[While this is largely self-explanatory, it is worth noting that, increasingly, wording for the acceptance of electronic confirmations in the energy-trading industry is being placed into ISDA Schedules. Several organizations have electronic confirmations systems for energy swaps. These include the Intercontinental Exchange (www.intcx.com), which has also launched such a system for trades executed via its ICE platform. NYMEX has electronic confirmation of OTC deals registered via its online system, Clearport.

Following is an example of the wording used to allow acceptance of electronic confirmations:

"Electronic Confirmations. Where a Transaction is confirmed by means of an electronic messaging system that the parties have elected to use to confirm such Transaction such confirmation will constitute a 'Confirmation' as referred to in this agreement."]

5. Automatic Early Termination. If Automatic Early Termination is specified as applying to a party in Part 1 paragraph 5 above, that Party shall upon the occurrence of an Event of Default notify it immediately to the other Party and provided further that Automatic Early Termination shall not apply to either party if the Event of Default concerned is the presentation of a winding up petition which is withdrawn without advertisement. In the event of absence of such notice on the day of the occurrence of the Event of Default, the Defaulting Party shall fully indemnify the Non-defaulting Party on demand against all expense, loss, damage or liability that the Non-defaulting Party may incur in respect of this Agreement and each Transaction as a consequence of movements in interest, currency, exchange or other relevant rates or prices between the Early Termination Date and the local Business Day on which the Non-defaulting Party first becomes aware that the Early Termination Date has occurred under Section 6(a). The Non-defaulting Party may for this purpose convert any expense, loss, damage or liability to the Termination Currency.

6. Early Termination. At the end of Section 6 add the following Sections 6(f) and (g):

(f) *Conditions of Certain Payments*. Notwithstanding the provisions of Section 6(e), the Non-defaulting Party shall have no obligation to make any payment on Early Termination to the Defaulting Party unless and until the Non-defaulting Party shall have received confirmation satisfactory to it in its sole discretion (which may include an unqualified opinion of its counsel) that (i) in accordance with Section 6(c)(ii) of the Agreement, no further payments or deliveries under Section 2(a)(i) or 2(e) in respect of Terminated Transactions will be required to be made and (ii) each Specified Transaction shall have terminated pursuant to its specified termination date or through the exercise by a party of a right to terminate and all obligations owing under each such Specified Transaction shall have been fully and finally performed; and

(g) (i) Without affecting the provisions of this Agreement requiring the calculation of certain net payment amounts, all payments under this Agreement will be made without set-off or counterclaim; provided, however that any amount (the "Early Termination Amount") payable to one party (the Payee) by the other party (the Payer) under Section 6 (e) in circumstances where there is a Defaulting Party or one Affected Party in the case where a Termination Event under Section 5 (b) (i) to (v) inclusive has occurred, will, at the option of the party ("X") other than the Defaulting Party or the Affected Party (and without prior notice to the Defaulting Party or Affected Party), be reduced by its set-off against any amount(s) (the "Other Agreement Amount") payable (whether at such time or in the future or upon occurrence of a contingency) by the Payee to the Payer (irrespective of the currency, place of payment or booking office of the obligation) under any other agreement(s) between the Payee and the Payer or instrument(s) or undertaking(s) issued or extended by one party to, or in favor of, the other party (and the Other Agreement Amount will be discharged promptly and in all respects to the extent it is so set-off). X will give notice to the other party of any set-off effected under this Section.

(ii) For this purpose, either the Early Termination Amount or the Other Agreement Amount (or the relevant portion of such amounts) may be converted by X into the currency in which the other is denominated at the rate of exchange at which X would be able, acting in a reasonable manner and in good faith, to purchase the relevant amount of such currency.

(iii) If an obligation is unascertained, X may in good faith estimate that obligation and set-off in respect of the estimate, subject to the relevant party accounting to the other when the obligation is ascertained.

(iv) Nothing in this Section 6(g) shall be effective to create a charge or other security interest. This Section 6(g) shall be without prejudice and in addition to any right of set-off, combination of accounts, lien or other right to which any party is at any time otherwise entitled (whether by operation of law, contract or otherwise).

7. Transfer. Rights and obligations under this Agreement or any Transaction may not be transferred, in whole or in part, except upon the prior written consent of both parties and any such transfer made without such consent shall be void.

[Often counterparties, for reassurance that the other party will accept a reasonable transfer of rights and obligations under the ISDA Agreement, will insert the following phrase: "which consent shall not be unreasonably withheld".]

8. Default Rate. The Default Rate shall mean 1% over LIBOR compounded on a daily basis where "LIBOR" on any day shall mean the one-month London Interbank Offered Rate as reported in *The Financial Times* or if *The Financial Times* ceases publication temporarily or permanently, such other newspaper published in London as Party B may determine.

[If one of the counterparties defaults on a payment then the other is entitled to charge interest on monies owed.]

9. Physical Delivery. Unless specifically stated to the contrary in a signed Confirmation, no physical delivery by either party shall take place under the terms of this Agreement and Transactions entered into hereunder shall be settled in cash only.

[ISDA OTC derivatives trades in energy are all cash-settled]

10. Telephone Recording. Each party to this Agreement acknowledges and agrees to the electronic recording of telephone conversations between the parties (including any director, officer, employee, agent or representative thereof) and whether by one or other or both of the parties and that any such recording may be submitted in evidence to any court or in any proceedings for the purpose of establishing any matters pertinent to any Transaction.

[Electronic trading platforms are making progress in penetrating the OTC energy market, but outside the United States, the market practice is still generally to trade over the telephone. Consent has to be given to telephone recordings if they are to be used for any legal purposes in the future.]

11. Designated Account Details for U.S. Dollar Payments.

(a) In the case of Party A: As specified by Party A when returning the Confirmation from Party B.

[or the counterparty can state its banking details under this agreement and it can change them in the future by giving five local business days' notice]

(b) In the case of Party B:

Name of Bank :	XYZ Bank Ltd
Account Number:	08231-89178236-73624-02
Account Name :	XYZ Bank Derivatives Receipts

12. "Market Disruption Event" means the occurrence of any of the following events in the reasonable determination of the Calculation Agent:

(a) Price Source Disruption;

[where a settlement price is not available for some reason; for example, it has not been published by the reference agency (say,Platts) on a day it would normally be available.]

(b) Trading Suspension;

[A look-a-like swap would settle, for example, against a futures market settlement price each day during the pricing period, if the futures market was suspended.]

(c) Disappearance of Commodity Reference Price;

[where a publisher stops publishing the price reference the counterparties are using as the floating price reference on a derivatives trade]

(d) Material Change in Formula;

(e) Material Change in Content;

(f) Trading Limitation.

15. Disruption Fallbacks relating to Commodity Transactions:

The following Disruption Fallbacks (as defined in the 1993 Commodity Definitions) shall be applicable in each case in the order in which they appear:

(i) in respect of any Transaction having a Calculation Period or Calculation Periods which are greater than or equal to one calendar month:

(a) Average Daily Price Disruption, with Maximum Days of Disruption equal to five;

(b) Fallback Reference Price;

(c) Negotiated Fallback;

(d) The Parties shall appoint a single independent expert to determine an alternative pricing method. If the parties fail to agree on the appointment of an expert, the Chairman for the time being of the Institute of Petroleum in the United Kingdom shall be requested by either party to make such appointment within two days of request. An expert, if appointed, shall be deemed not be an arbitrator but shall render his decision as an expert and his determination shall be final and binding upon both parties save in the event of manifest error or fraud; and

[In this example, where everything else fails, both parties will approach the Chairman of the Institute of Petroleum as an expert to establish the price.]

(e) No Fault Termination.

(ii) in respect of any Transaction having a Calculation Period or Calculation Periods which are less than one calendar month:

(a) Average Daily Price Disruption, provided that the Maximum Days of Disruption shall be zero where the Calculation Period is less than or equal to two Commodity Business Days; one, where the Calculation Period is between three and five Commodity Business Days inclusive; two where the Calculation Period is between six and ten Commodity Business Days inclusive; three, where the Calculation Period is between eleven and fifteen Commodity Business Days inclusive; and four, where the Calculation Period is greater than sixteen Commodity Business Days inclusive;

(b) Fallback Reference Price;

(c) Negotiated Fallback;

(d) The Parties shall appoint a single independent expert to determine an alternative pricing method. If the parties fail to agree on the appointment of an expert, the Chairman for the time being of the Institute of Petroleum in the United Kingdom shall be requested by either party to make such appointment within two days of request. An expert, if appointed, shall be deemed not be an arbitrator but shall render his decision as an expert and his determination shall be final and binding upon both parties save in the event of manifest error or fraud; and

(e) No Fault Termination.

All determinations and calculations hereunder by the Calculation Agent shall be made in good faith, in the exercise of its commercially reasonable judgment and only after consultation with the other party.

16. Commencement Date. This Agreement is deemed to have come into effect on 15 December 2007.

COREX Trading Limited	XYZ Bank Limited
By:	By:
Name:	Name:
Title:	Title:
By:	By:
Name:	Name:
Title:	Title:

ADDITIONAL NOTES

• Withholding Tax & ISDA

Counterparties should undertake detailed legal and tax analysis at the start of their business relationship to ensure that no withholding tax is likely to be charged in any of the jurisdictions through which the counterparty proposes to trade OTC derivatives. ISDA's legal infrastructure makes provisions against being caught out by withholding tax by making the counterparty pay the net amount (net of any taxes payable in their home country).

• Netting & ISDA Agreements

The ISDA Master Agreement has established international contractual standards governing privately negotiated derivatives transactions that reduce legal uncertainty and allow for reduction of credit risk through netting of contractual obligations. Ensuring the enforceability of the netting provisions remains a key initiative for ISDA, because of its importance in reducing the credit risk arising from the OTC derivatives business. ISDA's work in this area has resulted in a series of laws being passed in various countries that ensure legal certainty surrounding the process of netting in those nations.

Many countries have already confirmed acceptance of netting procedures in OTC transactions via the ISDA Master Agreement and this number continues to grow. ISDA's website (www.isda.org) publishes regular updates on legal opinions by country, together with the results of the operational surveys and swaps trading volumes reported annually by ISDA members.

Table 12.1 Status of netting opinions (June 2007)

Country	Received	Counsel
Anguilla	✔	Harney Westwood & Riegels
Australia	✔	Mallesons Stephen Jaques
Austria	✔	Schönherr
Bahamas	✔	Higgs & Johnson
Barbados	✔	Chancery Chambers
Belgium	✔	DLA Piper Rudnick Gray Cary
Bermuda	✔	Appleby, Spurling & Kempe

Country	Received	Counsel
Brazil	✔	Joint opinion from Pinheiro Neto Advogados & Mattos Filho Veiga Marrey Jr. e Quiroga Advogados
British Virgin Islands	✔	Walker Smiths
Canada	✔	Stikeman, Elliott
Cayman Islands	✔	Maples & Calder
Channel Islands (Guernsey)	✔	Ogier & Le Masurier
Channel Islands (Jersey)	✔	Ogier & Le Masurier
Czech Republic	✔	Allen & Overy
Denmark	✔	Gorrissen Federspiel Kierkegaard
England	✔	Allen & Overy
Finland	✔	Hannes Snellman
France	✔	Gide Loyrette Nouel
Germany	✔	Hengeler Mueller Weitzel Wirtz
Greece	✔	Karatzas & Partners
Hong Kong	✔	Allen & Overy
Hungary	✔	Allen & Overy
Iceland	✔	L O G O S Legal Services
India	✔	Mr. Atul Setalvad and Juris Corp.
Indonesia	✔	Ali Budiardjo, Nugroho, Reksodiputro
Ireland	✔	McCann FitzGerald
Israel	✔	Meitar Liquornik Geva & Leshem Brandwein, Law Offices
Italy	✔	Allen & Overy
Japan	✔	Linklaters
Luxembourg	✔	Allen & Overy Luxembourg
Malaysia	✔	Shearn Delamore & Co.
Malta	✔	Ganado & Associates – Advocates
Mexico	✔	Ritch Heather y Mueller
The Netherlands	✔	De Brauw Blackstone Westbroek
Netherlands Antilles	✔	Clifford Chance

Country	Received	Counsel
New Zealand	✔	Bell Gully
Norway	✔	Wiersholm, Mellbye & Bech
Philippines	✔	SyCip Salazar Hernandez & Gatmaitan
Poland	✔	Allen & Overy
Portugal	✔	Abreu & Marques, Vinhas
Scotland	✔	Dundas & Wilson
Singapore	✔	Allen & Gledhill
Slovakia	✔	Allen & Overy
South Africa	✔	Webber Wentzel Bowens
South Korea	✔	Kim & Chang
Spain	✔	Allen & Overy
Sweden	✔	Wistrand
Switzerland	✔	Prof. Dr. Dieter Zobl and Dr. Thomas Werlen
Taiwan	✔	Russin & Vecchi
Thailand	✔	Baker & McKenzie
Turkey	✔	Pekin & Pekin
United States	✔	Allen & Overy

Total Netting Opinions: 52 Source: *www.isda.org*

THE ISDA AGREEMENTS: A COMPARISON "1992 VERSUS 2002 VERSION"

Although ISDA 2002 and ISDA 1992 are similar in many ways, substantial revisions have been made to some of the more fundamental provisions of ISDA 1992.

The most interesting development relating to ISDA-based Swaps deals is in the area of confirmations, which can now, finally, be executed and delivered by exchange of emails. Note, though, that the Agreement itself can only be executed and delivered by fax or electronic messaging system (which ISDA 2002 appears to differentiate from emails). Notices or other communications in respect of Events of Default, Termination

Events and Early Termination may not be given by either email or electronic messaging system. Other key changes include:

Failure to pay or deliver: A failure to pay or deliver must be remedied within one local business day (or one local delivery day in the case of deliveries) of notice of such failure being given to the relevant party in order to avoid an event of default. ISDA 1992 allowed a grace period of three local business days.

Breach of Agreement; Repudiation of Agreement: ISDA 2002 incorporates a new subsection giving rise to an Event of Default if a party disaffirms, disclaims, repudiates or rejects, in whole or in part, or challenges the validity of, the Master Agreement, any Confirmation or any Transaction evidenced thereby. This subsection is similar to, and is in addition to, the Credit Support Default under 5(a)(iii)(3) of ISDA 1992 in respect of Credit Support Documents.

Credit Support Default: The failing or ceasing of any security interest granted by a party or a Credit Support Provider to the other party pursuant to a Credit Support Document can give rise to an Event of Default.

Default Under Specified Transaction: This section has been amended to separate (i) defaults in making payment on the last payment or exchange date (or any payment on an early termination); (ii) defaults in making any delivery; (iii) any other defaults (other than delivery); and (iv) disaffirming, disclaiming, repudiating, rejecting or challenging the validity of a Specified Transaction. Delivery default and other defaults require the subsequent liquidation or acceleration of obligations under the relevant Specified Transaction (in respect of all defaults excepting delivery) or all transactions outstanding under documentation applicable to that Specified Transaction (in respect of delivery default only). Final payment default allows a grace period of one day but requires no further knock-on effects in order to constitute an Event of Default. Each of the defaults, with the exception of final payment default, now refers expressly to a default under any credit-support arrangement relating to a Specified Transaction as being capable of giving rise to an Event of Default under this heading. The definition of Specified Transaction under ISDA 2002 expressly excludes Transactions under the Agreement.

Cross-Default: The first paragraph of this Event of Default has been amended to clarify that the Threshold Amount relates to the size of the aggregate principal amount of the agreements or instruments in respect of which there has been a default, event of default, and so on. Whereas this is probably what was intended by ISDA 1992 as well, there was perhaps room for debate as to whether the Threshold Amount applied to the size of the Specified Indebtedness or the size of amounts involved in the default.

Bankruptcy: Although the provisions are largely the same as they were in ISDA 1992, there have been changes made to the applicable grace periods. Where a party institutes, or has instituted against it by a regulator, supervisor or any similar insolvency officer, insolvency or bankruptcy proceedings, it would appear that an Event of Default will arise immediately, without reference to any grace period or the entering of any judgment. Where proceedings are instituted against it by any other entity, such proceedings can give rise to an Event of Default if either (i) they are not dismissed within 15 days or (ii) judgment is entered. The grace period under ISDA 1992 was 30 days. Also a reduction in grace period has been made with respect to circumstances where a secured party takes steps to enforce its credit security.

Termination Events: The principal changes to the Termination Events are the expanded section concerning Illegality and the inclusion of *Force Majeure*. ISDA 2002 does not make express reference to a change in law or interpretation and merely requires that the Illegality be due to an event or circumstance (other than any action taken by a party or, if applicable, a Credit Support Provider of such party) occurring after a Transaction has been entered into. The subsection dealing with Illegality of a Transaction has been changed to make it clear that the Illegality should affect the Office through which payments and deliveries are effected in respect of a Transaction, and that the ability to take receipt of payments and deliveries is also included. The subsection dealing with Illegality in respect of a Credit Support Document has been restricted to cover only obligations to make or receive payments or deliveries or compliance with any other material provision of the affected Credit Support Document.

***Force Majeure*:** This is like the optional "Impossibility" provision, which was suggested within the user's guide to ISDA 1992. *Force Majeure*, like Illegality, has been made office-specific and expressly includes the ability to take receipt of deliveries and payments as well as the ability to make them. Of potential concern to counterparties to the ISDA 2002 is the expansion of *Force Majeure* to include not just circumstances where performance is pretty much impossible, but also where the affected trading office is prevented from performance or where performance is impracticable. Like Illegality, *Force Majeure* can arise in respect of a Transaction or in respect of a Credit Support Document; the provision is split into two subsections, each covering one of the two options. The principal difference between the operation of *Force Majeure* and Illegality is that the former requires not only that the relevant cause be out of the control of the affected office, party or Credit Support Provider but will only apply if such office, party or Credit Support Provider could not overcome the prevention, impossibility or impracticability having used reasonable efforts such as would not require such party to incur more than incidental losses. In other words, the party has to make sure that it really cannot get around the problems it faces.

Credit Event Upon Merger: This Termination Event has been amended in two ways: first, by a redrafting of the section by reference to separate Designated Events (the first of which being the equivalent ISDA 1992 Termination Event), the inclusion of an express requirement to take account of any Credit Support Document and by the expanding of the equivalent ISDA 1992 wording to include the transfer of a substantial part of a party's assets, as well as reorganization, reincorporation and reconstitution; and second, by the addition of two, new, Designated Events. The first of these is the acquisition of an ownership interest in a party by any person, related to an entity enabling such person to control that party. The second is the making by a party of any substantial change in its capital structure by means of the issuance, incurrence or guarantee of debt or the issue of either (i) preferred stock or other securities convertible into debt or preferred stock or (ii) an ownership interest in that party. These new Designated Events were not previously included in the ISDA 1992 and do seem open to a fairly broad interpretation.

Deferral of Payments: ISDA 2002 introduces deferral provisions which will be effective upon the occurrence of an Illegality or *Force Majeure*. The new provisions defer any payment or delivery obligations under a transaction affected by Illegality or *Force Majeure* so that such obligation does not become due until the earlier of (i) the first local business day (or local delivery day in the case of deliveries) after the applicable Waiting Period, and (ii) the date on which the event or circumstance giving rise to the Illegality or *Force Majeure* ceases to exist. The Waiting Periods are set out in ISDA 2002 as three local business days in respect of Illegality and eight local business days in respect of *Force Majeure*. However, this will be reduced to zero in each case in respect of Illegality or *Force Majeure* affecting Credit Support Documents, where delivery or payment is actually required on the relevant day.

Close-out Netting — Early Termination: Although the principal difference between the early-termination provisions of ISDA 1992 and ISDA 2002 is the differing method of valuation, there are a number of other changes, many of which build upon the newly expanded Illegality and the newly introduced *Force Majeure* Termination Events.

Rights to Terminate contracts: The provisions relating to the right to terminate following an Event of Default are unchanged, as are the provisions relating to the right to terminate following a Termination Event (save for the exclusion of Illegality from the list of Termination Events giving rise to an obligation to transfer or reach agreement). ISDA 2002 contains two new provisions that relate solely to Illegality and *Force Majeure*. Unlike the other Termination Events, except in certain limited circumstances, either party may designate an Early Termination Date in respect of all, or less than all, Affected Transactions. If one party serves notice terminating less than all Affected Transactions, the other party may respond, designating the same Early Termination Date in respect of all Affected Transactions. In the case of Illegality and *Force Majeure* affecting Credit Support Documents, only the non-affected party can serve an initial notice terminating either all or less than all Affected Transactions. However, if less than all Affected Transactions have been terminated, the affected party does have the right to respond with a designation of an Early Termination Date in respect of all Affected Transactions.

Payments on Early Termination: Unlike its predecessor, ISDA 2002 only permits parties to use the Close-out Amount valuation method. The mechanics of arriving at an Early Termination Amount owing once the Close-out Amount is established are similar in operation to calculating an amount owing on an Early Termination Date once a Settlement Amount has been determined in accordance with the Second Method and Market Quotation election under ISDA 1992. The

Early Termination Amount will generally be equal to the sum of the Close-out Amount determined by the Determining Party (or half the difference between the Close-out Amounts determined by each party in the case of a termination following a Termination Event with two Affected Parties) and any Unpaid Amounts owing between the parties.

Set-off: This provision is included for the first time within ISDA 2002, although it is substantially similar to the suggested "Set-off" provisions in the user's guide to ISDA 1992. The effect of the provision is to enable the non-Defaulting Party or non-Affected Party (provided that all outstanding Transactions are Affected Transactions) in circumstances where there is one such party to elect that any Early Termination Amount owing be reduced to the extent of any other amounts owing between the parties. In order to satisfy the requirement for mutuality between the parties in order for Set-off to apply, ISDA 2002 also incorporates a representation that parties are dealing as principals in respect of all Transactions.

Office multi-branches: The provisions dealing with multi-branch arrangements have been expanded in ISDA 2002. Counterparties are expressly prevented from having recourse to the head office of a multi-branch party in respect of deliveries or payments deferred in accordance with the provisions of ISDA 2002 following an Illegality or *Force Majeure* for so long as those deliveries or payments are so deferred. New deeming provisions have also been included whereby a party will be deemed to have entered into a Transaction through its head office, unless otherwise specified in the applicable Confirmation or agreed between the parties.

For further information, see:
www.isda.org/publications/isdamasteragrmnt.html

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 13

Energy-Market Hedging Scenarios

WHAT IS HEDGING?

Hedging is the process in which an organization with energy-price risk will take a position in a derivative instrument (swaps, options, futures) that gives an equal and opposite financial exposure to the underlying physical position to protect against major adverse price changes. The volumetric price exposure of the derivatives hedging instrument should be equal and opposite to the price exposure of the physical energy commodity in which the organization wishes to reduce its price-risk exposure.

Energy consumers such as power stations, airline companies using jet fuel, shipping companies using bunker fuel, or metal-ore smelters using coal, natural gas, oil or electricity do not normally hedge all of their physical volume consumption; nor do they ignore hedging altogether. The majority of active hedgers in the energy markets typically hedge up to a maximum of 50% of their physical volume in order to reduce their company's balance-sheet volatility. They hedge more than 50% only when the market is extremely volatile; for example, during periods like the Gulf War. However, most of the time, an end-user consumer of energy may only hedge 30–50% of energy requirements in, say, three to four years into the future, with up to 75% of exposure hedged in the six–to–12-month timeframe (that is, up to the end of its next financial year). For example, British Airways hedges up to four years into the future hence the jet-fuel derivatives positions may only account for 10% of its exposure. The only regular exceptions to this rule are charter airlines which have already sold all seats on flights to travel agencies, so their income is fixed and they have 100% exposure to jet-fuel movements. In this case, charter airlines tend to hedge 100% (or close to it) of their planned consumption volume.

For an energy producer, there is no such thing as "over-hedging" or creating a derivatives position greater than its physical consumption or production volume. If an organization is doing this, it is simply speculating. Companies should ensure that any derivatives activity remains within the parameters agreed by the board of directors and the risk-management committee or risk manager.

GENERAL RECAP ON ENERGY DERIVATIVES

- Swaps usually settle on a calendar-month basis, against the average of the daily commodity price in that period. For example, January will cover the pricing period 1 January to 31 January. Quarterly and annual structures are possible, but even these settle out every month. For example, in a quarterly contract, one-third will be settled out each month during the pricing period.
- Energy futures contracts tend to have expiry/termination dates during the month they are named. So January ICE Brent will expire three days prior to the 15th day of January. It is important to ensure that the futures contract chosen will give price coverage for the required time window.
- In swaps pricing against oil markets, there are half-month contracts — for example, 1st–14th of the month , and 15th through to the last trading day of the month — but these are not as liquid and usually only available for relatively prompt dates.
- Natural gas is typically traded in spot markets, then calendar-month contracts in the future and winter/summer month periods trade as a package.
- Coal markets typically are traded as calendar-monthly contracts as well both in OTC and futures (where available).
- Power markets around the world are traded in off-peak, peak and monthly forwards, and sometimes in one-week periods. The most volatile, though, are power spot markets (such as day-ahead), which are generally traded in 30-minute blocks (thus, 48 contracts in one 24-hour day). Weekend trading prices will often be different from weekdays because of different power consumption profiles.
- Payment-due dates tend to differ; so for petroleum products in Asia the payment-due date on OTC derivatives tends to be between 10 and 14 business days after the last settlement date of the contract. (This is always specified in the contract confirmation.)

- When hedging, cash-flow risk should be predicted and planned for so that suitable provision can be made. This kind of risk can be created when the timing of payables/receivables on physical-energy buying/selling and derivatives hedges do not match up.

HEDGING APPLICATION EXAMPLES

The following examples can be applied across airlines, shipping companies and, in fact, anyone consuming energy, oil, gas, coal and so on. All that is required is to replace the example given with a different pricing-reference index.

- **Example 1: Fixed-price swap hedge by an airline**

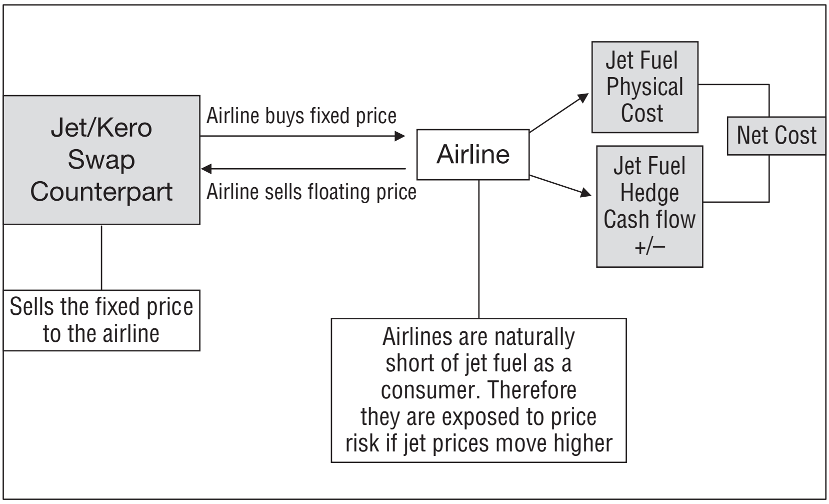


FIGURE 13.1 Fixed-price swap hedge by an airline

In this example, an airline buys a fixed-price swap from a bank or trader against its jet-fuel price exposure. It trades this swap under the ISDA Master Agreement with its counterparty. In the majority of cases, airlines will hedge into the next financial accounting year; that is, from one month up to around 18 months forward. Hedging volumes vary from airline to airline. In general, though, at least 20–30% of volumes are hedged a few years in the future, and up to 50% ahead of the start of the next financial year around the annual budgeted price, with additional volumes of 10–20% of total annual requirements locked in as opportunistic or protective hedges whenever prices drop below the annual jet-fuel purchasing budget price target. In "disaster" scenarios, airlines hedge prices for up to 100% of short-term requirements. This can happen in a situation similar to that of the Gulf War, which would prompt oil prices to move higher on Middle East tension.

Long-term large hedging of 100% of volumes is only seen in the market by charter airlines which have fixed income through forward seat sales to holiday companies. This means that they have no way to increase prices later to accommodate higher jet-fuel prices and therefore need to protect their usually thin and fixed profitability by fully hedging the price of forward jet-fuel requirements.

In the example illustrated in Figure 13.1, an airline buys a US$60 fixed-price swap for 50,000 barrels per month, against Singapore MOPS (Mean of Platts Singapore www.platts.com) as the pricing reference, for the calendar year 2008. In ISDA contract terminology, the airline is the "fixed price payer". Total volume is 50,000 barrels x 12 months = 600,000 barrels. Remember, when asking for quotes from traders directly or via brokers the quote is normally good for 50,000 barrels per month for products quoted in barrels or 5,000 MT per month for products quoted in metric tons (unless otherwise specified).

In oil swaps there is a financial settlement once a month (unlike financial markets such as interest-rate swaps where there is usually a settlement at the end of the swaps whole-pricing period; for example, a three-month interest-rate swap would have a cash settlement at the end of the three months.) Taking this into consideration, the cash flow of this 12-month hedge would be as shown in Figure 13.2.

Cal 2008	**A** Volume	**B** Fixed Price	**C** "MOPS"	**Monthly Settlement** (C – B) × A
Jan 08	50,000	60	59	–50,000
Feb 08	50,000	60	60	0
Mar 08	50,000	60	61	50,000
Apr 08	50,000	60	61.5	75,000
May 08	50,000	60	62	100,000
Jun 08	50,000	60	62	100,000
Jul 08	50,000	60	60	0
Aug 08	50,000	60	58	–100,000
Sep 08	50,000	60	57	–150,000
Oct 08	50,000	60	59	–50,000
Nov 08	50,000	60	61	50,000
Dec 08	50,000	60	63	150,000
Total Vol	**600,000 Barrels**			175,000 Net Result

FIGURE 13.2 Cash flow of 12-month oil-swap hedge transaction

As this is an Asian-based swap (Mean of Platts Singapore), the cash settlement is normally going to be due on the tenth business day of the month preceding the month already priced out (for example, for January 2008 the last pricing day would be 31 January). Payment for the cash settlement would be due on 14 February (subject to any banking holidays). In this scenario, the buyer of the swap would receive over the course of the year 2008 a positive net result of US$175,000 compensation for higher jet-fuel prices.

- **Example 2: Collar structure for end-user hedging**

This is more flexible because airlines normally want protection against a disaster-scenario increase in jet-fuel prices. Using the swaps market means they must lock in their minimum net price receivable at the current perceived swap value. However, using a collar structure as shown in Figure 13.3 the airline can still protect itself from a worrying price increase, but can keep its minimum net price receivable locked in at a lower rate than the current swap price.

Using a collar structure, the protection point can be tailored to suit the required jet-fuel budget level. It is created by buying a cap and selling a floor option. The purchase of the cap protects against jet-fuel prices rising above the strike of the cap, which in our example is US$24.

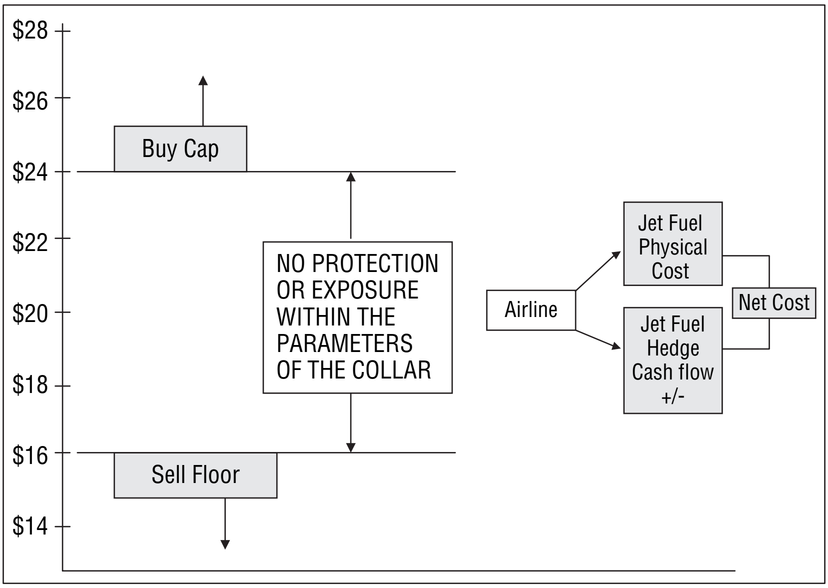


FIGURE 13.3 Collar-hedge structure

The sale of the floor reduces the cost of the premium in the purchase of the cap (which can be sizeable given the usual 12-month or longer tenures in airline-hedging programs).

A popular approach by end-users is to create a zero-cost collar by selling enough floor options and receiving enough in premium from these sales to compensate for the cost of the cap purchase.

The US$24 collar provides 100% upside protection on any month that the average price of the market moves above US$24. The sale of the floor at US$16 locks in the minimum net price that will be received on the jet fuel but at a lower level than the swap price that would have been received at the same execution point at this collar.

By playing with the levels of the cap and the floor, and with the volumes of the cap and/or floor, it is possible to create a zero-cost collar where the purchase of the cap is wholly subsidized by the sale of the floor, as shown in Figure 13.4. The contract volume is 50,000 barrels per month.

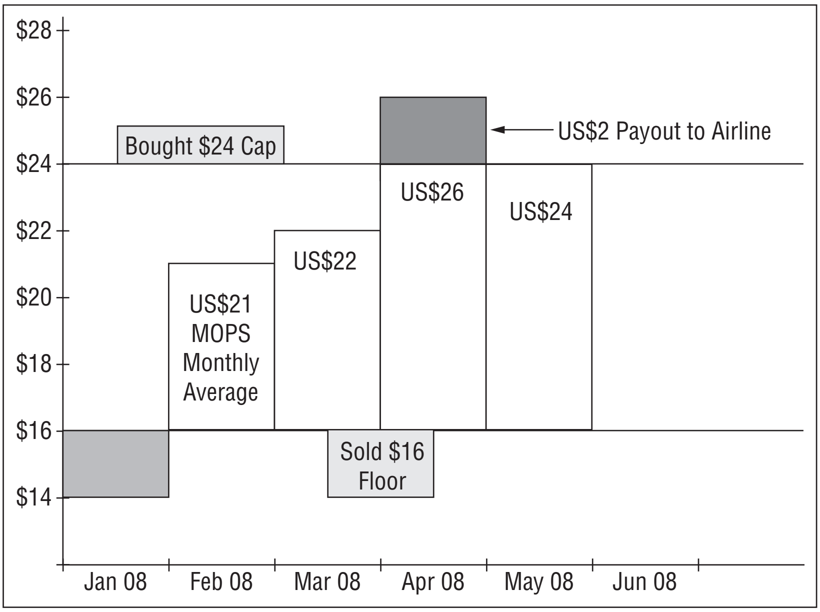


FIGURE 13.4 Price protection profile of collar-hedge example

Figure 13.5 illustrates an example cash-flow for the collar-hedge structure using prices illustrated above, with 50,000 barrels per month as the contract volume.

Cal 2008	A Volume	FLOOR Strike Price	CAP Strike Price	C "MOPS"	Monthly Settlement (C – B) × A	
Jan 08	50,000	16	24	14	–100,000	Jan
Feb 08	50,000	16	24	21	0	Feb
Mar 08	50,000	16	24	22	0	Mar
Apr 08	50,000	16	24	26	100,000	Apr
May 08	50,000	16	24	24	0	May

FIGURE 13.5 Example of collar-hedge structure

In January 2008 the price goes to US$14. Because the floor at US$16 was sold, this is the minimum net price for fuel the hedger can receive. The buyer may purchase cheaper physical oil in the market for approximately US$14, but then must pay US$100,000 for the difference between US$16 and US$14 (50,000 barrels x US$2). In February and March the Mean of Platts (MOPS) price is between the floor and the cap, so no compensation is received. In April the price goes above the cap, which was purchased at a strike of US$24, and the market goes to US$26, giving the buyer US$2 protection payment; that is, US$100,000 dollars (50,000 barrels x US$2). Remember, buying a cap option provides insurance that if the price goes above the chosen protection point (that is, the strike price), the buyer will receive unlimited benefits and compensation. Buying a floor option will provide the buyer with protection at the strike price chosen if the price goes below the chosen protection point. However, in selling a cap or a floor, the seller is, in effect, acting as the insurance company in giving the buyer unlimited protection against the market moving above the cap or below the floor strike price.

- **Example 3: Risk profile of an electricity producer**

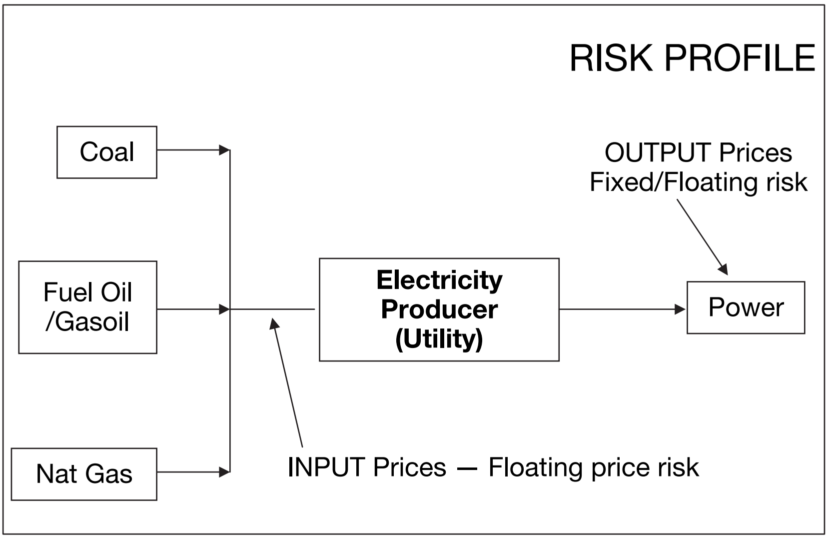


FIGURE 13.6 Risk profile of an electricity producer

The power producer (utility) in Figure 13.6 has a more complex risk than an airline, which is only worried about jet-fuel price risk (and perhaps forex risk). A power producer may need up to four different types of fuel: coal, fuel oil, gasoil, and natural gas. Because of this, the producer will have to observe movements in the "spark spread", which is the term used to describe the gross margin (excluding the cost of the power company's operations) between the cost of the chosen fuel and the resale price of the forward electricity/power produced. If the chosen fuel is coal, traders refer to this as the "dark spread" (the cost of burning coal and the price at which the power can be resold). Since the introduction of various carbon-emissions trading programs — for example, the EU ETS in January 2005 — traders also have to take into account the carbon footprint and cost associated with burning a particular type of fuel to generate electricity into the spark-and-dark spread equation.

A utility can control some of its price risk or profit-margin risk (depending on the type of power stations it operates) by switching fuels if, for instance, gasoil looks more cost-effective than fuel oil, or vice versa. A coal-fired power station would not switch over to oil-based products, nor would it switch from coal to natural gas. It may, however, have the opportunity to operate co-firing — burning a mixture of coal and renewable fuels such as wood chips, wood pellets, nutshells or other types of forest or plant residue, commonly referred to as "bio-mass". In the United Kingdom, power generators have been known to mix coal with 20% palm kernel expeller (PKE), which looks like compost soil bought from Malaysia.

On rare occasions when utilities are very close to a refinery, they may sometimes use naphtha for power production. In normal circumstances, though, naphtha is not a cost-effective fuel and coal, or fuel oil/gasoil or natural gas is used. Examples of this can still be seen in India.

In the United States, there are coal futures on NYMEX and swaps, good liquidity in the NYMEX natural-gas futures and an OTC derivatives market. Indeed, the OTC power market is very well developed, as it is for heating oil (gasoil) and fuel oil as well. On the East Coast there is the possibility of using heating-oil futures, although the majority of utilities will trade the natural gas/electricity spark spread. In Europe, utilities have a well-developed petroleum-product swaps market to use for hedging purposes and the ICE futures market also offers gasoil futures, which may offer some protection. On the natural-gas side, U.K. utilities can hedge in the ICE natural-gas futures, and there is also a well-developed natural gas NBP (natural balance point) U.K. gas swaps market (in mid-2002 trading was approximately six-times the volume of ICE NBP U.K. Nat Gas futures). Spark spreads are available from OTC traders as well, allowing the trading of the profit margin between natural gas piped in from the European North Sea and U.K. NETA forward power markets.

In continental Europe, utilities and traders are able to utilize electricity futures markets in Scandinavia, Holland, Germany and France, with border trading (where traders buy power in one country and take it across the border to sell in another) in Switzerland, Spain and Austria.

Natural-gas markets in continental Europe are not very deregulated. In most parts, countries keep control on overall power prices by controlling utility feedstock prices such as natural gas or oil or coal prices. This is changing, though gradually, as a result of action by the European Union Commission. As of early 2007, it is possible to trade in futures and OTC markets U.K. Gas, TTF Gas (TTF is an abbreviation of "trades executed for delivery to the Dutch Title Transfer Facility") — which is being touted as the future key hub index for continental Europe and the pricing of liquid natural gas (LNG) imports from Africa and the Middle East — and, last but not least, Zeebrugge Gas.

Details of these and other gas and electricity contracts can be found at Europe's leading gas and power broker, SPECTRON, at www.spectrongroup.com

HEDGING IN COAL MARKETS

Coal can be hedged in Europe and parts of Asia by using coal swaps based on API2, which represents physical coal delivered on a CIF basis into the major import hub of Amsterdam-Rotterdam-Antwerp (ARA), and API4 on an FOB basis into ARA. These indexes are the core basis for the financial swaps market in Europe. The price is decided by an average of the price published by two major coal-trade media outlets, McCloskey and Argus Media. Both outlets laid out their methodology for determining price and agreed to stick with it, providing a consistent basis for settling swaps.

Balancing a coal portfolio in the OTC swaps is quite simple. For example, coal buyers can sell swaps essentially to switch from payments based on a fixed-price contract to payments based on a floating price tied to an index. The swap can be sold to a third party (that is, a financial institution) without changing the terms of their physical contract. In an industry where coal contracts are often still negotiated directly and relationships are cultivated over long periods of time, the ability to hedge outside of physical contracts can be beneficial.

Although the European and U.S. over-the-counter coal markets emerged at roughly the same time, their development paths have diverged. Financial trades such as swap contracts traded against the API2 and API4 indexes now dominate the European market; the U.S. market comprises almost exclusively physical deals.

The U.S. OTC coal market was the first to develop in late 1997. Deregulation of the electric industry forced coal buyers to re-think how they procured supply. Utilities woke up to an emerging competitive market in which it would become increasingly difficult to pass on higher fuel costs to power consumers.

With a focus on the profit-and-loss account, the majority of coal buyers were reluctant to sign up to the long-term contracts which had been the industry standard in the past. Most preferred to seek out the best purchase price (or at least hedge their long-term contacts) in the OTC coal market. Producers eventually bought into the concept, and the market consequently developed exclusively with transactions settled on physical delivery of coal to the buyer.

Competitive pressures also drove the onset of the European OTC coal market, which emerged a little more than a year later. As in the U.S., European end-users dominated the initial market, which also focused on physically settled transactions.

Market players soon preferred to hedge prices through swaps, and they were greatly aided by the establishment of a widely accepted benchmark. The tide turned irrevocably from physical to financial when one of the largest producers serving the European market, BHP Billiton, threw its weight behind swaps in 2000.

Initially, the U.S. market experienced the fastest growth. Market volume jumped from an estimated 50 million metric ton (mt) traded in 1999 to an estimated 350 million mt in 2002. This represented the peak of the market, however, as the collapse of Enron and credit concerns with U.S. merchant generators prompted the erosion of market volume by the second half of 2002. Even by 2004 volumes had only recovered to roughly 200 million mt in the OTC market.

The European OTC market reached an estimated 100 million mt in volume in 2001. By 2006 the European OTC coal market had increased by more than 10 times, broken down as follows: API2 900 million mt; API4 400 million mt; FOB Newcastle 40 million mt, a total of 1,340 million mt, an increase of 70% over 2005 volumes of approximately 800,000 million mt.

For up-to-date details on this fast-developing coal swaps markets, see the following brokers' websites:

www.globalcoal.com
www.tfsbrokers.com
www.evolutionmarkets.com

U.K. SPARK SPREAD

When a spark-spread order is given it is usually quoted as a spread price in British pounds per megawatt hour (£/MWh). A preferred power price will be given and negotiation will develop from there via brokers or directly with another principal. Obviously, natural gas is not traded normally in MWh and so the natural-gas price has to be converted into an electricity equivalent. In the U.K. spark-spread market, a conversion rate of 49.1349% is used (representing 100,000 therms/60MWs). Once a preferred fixed price on the power is confirmed, the gas price is then calculated in pence/therm correct to three decimal places:

$$\text{Gas price in p/therm} = \frac{(\text{Power Price} - \text{Spread}) \times 24 \times 100 \times \text{Volume of Power}}{\text{Volume of Gas}}$$

$$= \frac{(\text{Power Price} - \text{Spread}) \times 24 \times 100 \times 60}{100{,}000}$$

Contracts are based on Standard GTMA (Grid Trading Master Agreement), and NBP 1997 Terms (which is the contract under which natural gas is traded in the U.K.).

The trade (if reported by brokers) is reported in as the spark-spread price level, and the fixed prices agreed for the gas and power (creating the spread) are not normally disclosed by OTC brokers.

- **Example 4: Hedging for a metal producer**

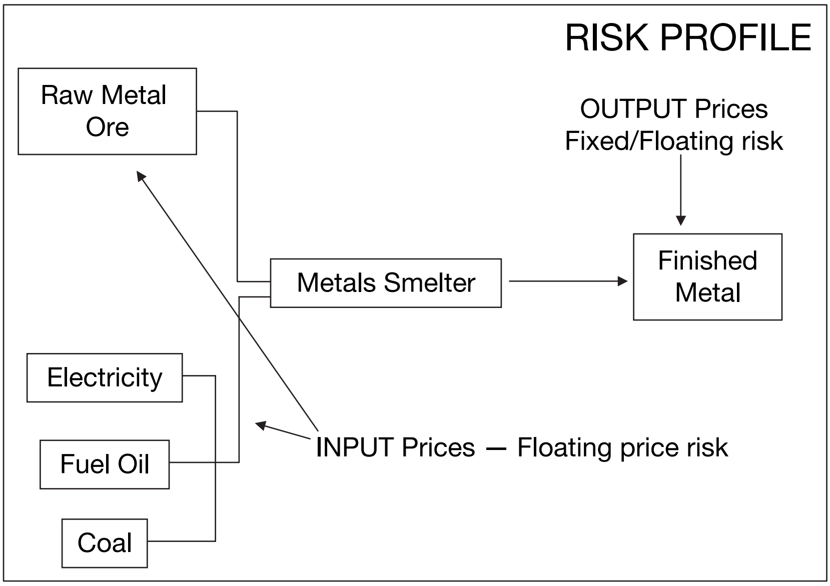


FIGURE 13.7 Generic price-risk profile of a metals smelter

In the situation illustrated in Figure 13.7, the metal producer can lock in the price value spread between the energy markets utilized to power its business and the finished metal using swaps or option derivatives.

Some banks can offer structures that give metal producers power prices/energy prices for their operation in a price related to the finished metal they produce. This is achieved by locking in the spread by selling forward metal derivatives and buying forward energy derivatives. The smelter is exposed to energy prices going up, which is protected by the long (purchased) energy derivatives. The smelter's profit margin is protected by the short (the sale) of metal derivatives.

- **Example 5: Crude-oil hedge from Middle East to Asia**

Typically, crude-oil cargoes are given a three- or five-day pricing window. Take, for example, a cargo of 500,000 barrels of Middle East crude destined for Singapore with a pricing window date range of 1–5 December 2007. Using January 2008 futures, 500 contracts of the Dubai Mercantile Exchange Oman Crude oil futures (equivalent to 500,000 barrels of crude) could be sold. A trader might typically sell futures contracts at the rate of 100,000 barrels per day on each of the five days during the pricing window and, by the end of the pricing window, will thus have hedged 500,000 barrels, as illustrated in Table 13.1.

Table 13.1 Timing of hedging events

500,000 barrels pricing out over five days, i.e. 100,000 barrels per day
Dubai futures contract 1,000 barrels per contract, so 100 contracts per day must be sold to lock in a hedge

	December	barrels	contracts	
Selling	1st	100,000	100	
Selling	2nd		100	
Selling	3rd		100	
Selling	4th		100	
Selling	5th		100	so by close of business 5th December you are long (bought) 500,000 barrels of physical and also now short (sold) 500,000 barrels or 500 contracts of Dubai futures
	6th			
		Journey Time		
	20th	21st December — As a user of the crude oil you may have storage facilities and use the oil slowly over the next 10 days. In this case, every day you buy back 50 lots or 50,000 barrels of hedge as you consume the oil		
Buying	21st	50,000	50	
Buying	22nd	50,000	50	
Buying	23rd	50,000	50	
Buying	24th	50,000	50	
Buying	25th	50,000	50	
Buying	26th	50,000	50	
Buying	27th	50,000	50	
Buying	28th	50,000	50	
Buying	29th	50,000	50	
Buying	30th	50,000	50	

In addition to the selling of futures contracts to place on the short hedge (between 1–5 December), Table 13.1 shows how firms commonly deal with the closing out of the hedge during consumption of the crude oil in their refinery system. It is common for crude oil to stay in tank storage on site at a refinery for several weeks before being used. This means the company still has a price exposure to this asset falling in value before it can be turned into petroleum products. Table 13.1 shows how the trader buys back 50,000 barrels per day or 50 contracts of the Dubai crude futures to close out the short hedge of 500 lots (500,000 barrels) from 21–30 December, which is the estimated time scale for this crude oil to be consumed in the refinery system.

	Bought Fixed Price Cash	**Sold Fixed Price Futures**
1st to 5th	60	60.35
	Sold Cash	Bought Futures
21st to 30th	59	59.35
	A	**B**
Gross Profit (loss)	–1	1
Net Position (A + B)	0	

FIGURE 13.8 The cash flow of the EFP hedge approach

Figure 13.8 shows the cash flow of the EFP hedge approach shown in Table 13.1. In this scenario, there was a perfect hedge and the futures contracts protected the value of the crude oil during its long journey to the refinery. This meant that there was no financial loss whilst the crude oil was on the water and in tank at the refinery.

Now imagine that the refinery has put the crude oil into storage and is consuming 50,000 barrels a day. During the course of 10 days (10 x 50,000 = 500,000 barrels) the trader will wish to remove, close out, the futures or indeed swaps hedge against the physical crude oil. Otherwise, the crude oil will be consumed, leaving the trader with a naked derivatives position — that is, no physical commodity — so that overnight it would turn into a speculative trade.

- **Example 6: Hedge cash flow for a crude-oil import hedge**

This is an example of a refinery hedging its crude-oil imports because it is naturally short crude; that is, it always consumes crude oil and hence always has to buy physical crude oil, and cannot be totally switched off except at great expense. In fact, most refineries have to run at a minimum of 60% capacity, otherwise they have to be shut down, and restarting a refinery is an extremely expensive and dangerous process. The risk profile here is that the refiner is exposed to crude-oil prices moving higher and threatening its profit margin.

So the U.S. refiner buys NYMEX WTI Crude futures (or whole-month average swaps based against WTI pricing) with a view to protecting its January crude physical requirements from a price increase.

1 October: Buys January NYMEX WTI Futures @ US$53
10 December: The refiner purchases its crude oil @ US$54.75
Sells same volume futures @ US$54.75
Profit on Futures = US$ 1.75

The effective netted buying price is: Hedge + Physical purchase price
US$54.75 – US$1.75 hedge profit = US$53.00

- **Example 7: Hedge for crude-oil producer**

A simple hedge for a crude-oil producer would be as follows:

A crude producer is naturally long crude because it has crude in the ground and thus is exposed to prices going down. It therefore needs to create a short position in a derivatives hedge structure.

For this example, the producer sells its crude oil on a Brent crude-related price basis, so its price exposure is in terms of Brent crude oil. The producer has seen crude prices reach a high level because of political tensions in the Middle East, so it is too expensive to buy some put options (floor) on their own. In these circumstances, it could do one of two things: it could sell Brent-related futures (for example, ICE Brent Futures in London). This is a good idea if the producer wishes to remain anonymous and not scare the market that it is selling. Alternatively, it might sell Brent-related OTC Swaps with other oil companies and banks. While this may be a more flexible option, the producer may not wish to reveal its hedging intentions directly to other traders in the OTC market place.

In our example, the producer chooses to sell ICE Brent Futures, as follows:

5 December: Sells January ICE Brent Futures @ US$59.50 per barrel
15 January: Sells physical crude @ US$60.50 per barrel
Buys back same volume of futures @ US$60.50 per barrel
Therefore, Futures loss = US$1.00 per barrel

Effective netted crude sale price = Physical sale price + Hedge result
= US$60.50 + US$1.00 loss
= US$59.50 per barrel

- **Example 8: Hedge crude-oil producer using floors with a knock-out**

The other alternative which can be applied not only to a crude-oil producer but to any energy producer is to use floors (puts) with a knock-out option.

In this scenario, the producer has found that because the oil price has been moving higher and, believing that prices will continue to move higher, does not wish to sell futures or swaps and lock in the price and thus create some potential loss of opportunity if prices continue to rise (as shown by the previous example with a loss on the hedge).

A more appetizing solution in such circumstances is to buy floors (puts). But, for the purposes of this example, the cost of buying a floor is too expensive. One way around this would be for the producer to look at introducing a knock-out into the floor structure to try to reduce the overall cost of the option. In a hedging scenario, whatever the energy product being produced, it would be best to buy an out-of-the-money floor and request a knock-out above the market.

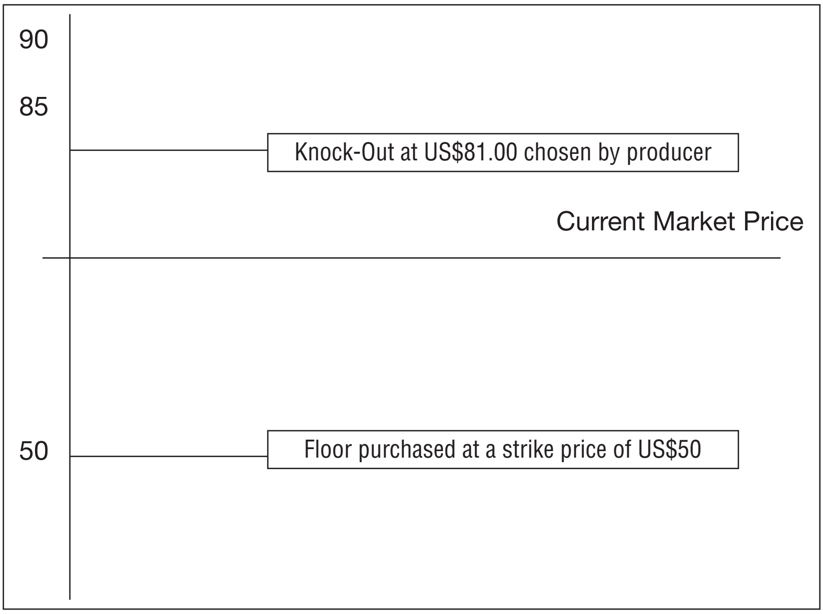


FIGURE 13.9 Floor option with knock-out option

As illustrated in Figure 13.9, the trader or market maker has given the producer a cheaper floor option to protect against prices going down, because the producer has given the seller some room to maneuver — the knock-out. In effect, what the producer has said to the seller is that if the market goes up to US$81 during the lifetime of the option, the option is automatically cancelled. So the seller of the option has the added potential of receiving premium for a long-term option, which may actually be cancelled before it reaches maturity or expiry date. This lets the seller off the hook without any more exposure to the producer.

A rebate structure can also sometimes be negotiated. In this instance, if the option were cancelled, the producer who is hedging might receive back some percentage of the original premium he had paid out for the option.

- **Example 9: Refinery margin hedge**

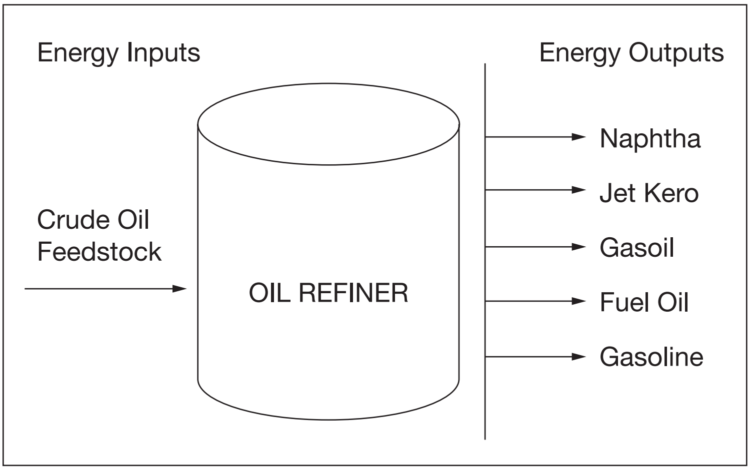


FIGURE 13.10 Key inputs and outputs requiring hedging for an oil refinery

In this example a refinery has good margins on jet kero and gasoil but its fuel oil margins are negative. (Fuel oil makes up to 20% of the output of some older refineries, although newer ones tend to reprocess a lot of fuel oil and a modern refinery may only produce an estimated 10% fuel oil).

This refinery is using crude oil from the Middle East, pricing against the average of Platts Oman crude oil. To hedge the crude-oil imports for the refinery the traders will sell OTC crude-oil swaps pricing against the Platts Oman average. It buys two million barrels of Middle East crude priced against Oman on 1–5 January. Since not all of the petroleum product output is being hedged, the first thing to do is to add up the volume of the products (convert into barrels where necessary) and make sure that only this amount of crude is hedged. This is illustrated in Table 13.2.

On the basis of these figures, one million barrels of product are being hedged so we also need to lock in one million of the crude. Thus, for the first four days of the pricing window the traders will sell 125,000 barrels of Platts Oman related swaps and on the last day they will sell 500,000 since the crack option on the fuel oil is placed in the option market all in one go. By the sixth day, the trader will have a cargo of physical on the water on its way to the refinery and a paper hedge of one million barrels notional quantity protecting the value of the crude.

Table 13.2 Refinery hedging approach

		Crude Oil Import Feedstock			Petroleum Product Production Hedge		
		Physical	Hedge Short	Volume	Sold Swaps Jet Kero	Sold Swaps Gasoil	FUEL OIL CRACK OPTION BOUGHT FLOOR @ US$110 per MT (using 6.7 conversion from MT to barrels)
January	1st	25	24.95	125,000	50,000	75,000	0
	2nd	24.89	24.84	125,000	50,000	75,000	0
	3rd	24.86	24.81	125,000	50,000	75,000	0
	4th	24.5	24.45	125,000	50,000	75,000	0
	5th	24.65	24.6	500,000	50,000	75,000	375,000
TOTAL	**6th**	**24.78**	**24.73**	**1,000,000**			

At the same time, the trader starts hedging the future production of the refinery from this crude oil.

For jet fuel and gasoil, the margin is looking healthy, so the trader may just sell the forward swaps to lock in the value of the jet fuel and gasoil. He makes sure that he sells swaps which cover the time period that the refinery will be producing petroleum products from the crude currently on its way to the refinery. For example, if someone bought West African crude and shipped it to Japan for refining, it could take four weeks to get there. In hedging the crude oil it would be necessary to ensure that the derivatives contract did not expire before the products could be produced from the crude. Also it might mean that the products would not actually be sold from the refinery for several months after the crude was purchased.

To return to our original scenario, the fuel oil has a negative refining margin. The refinery cannot be shut down, so the owners need to protect against this margin getting still worse. However, if they were to sell OTC swaps contracts in fuel oil this would lock in the price 100%, and if the refinery margin improved they would not be able to benefit from that improvement. However, for the purposes of this example, the refinery decides to utilize a crack option. As discussed in earlier chapters, it is possible to buy (or even sell) crack options on refinery margins. (The same thing in the power industry would be considered spark-spread options — the spread between input energy such as natural gas, gasoil, fuel oil, or coal, and the output of electricity in Mw Hours). So, the refinery could buy a floor (put) option against the margin getting worse. The benefit of the option is that if the refinery margin improved, the refinery could benefit from 100% of the improvement (after the margin has improved enough to cover the cost of the option for the hedge). To reduce the cost of the crack-option strategy, the refiner could ask market makers, banks and traders to quote a zero-collar crack-option structure. In this case the refiner would still buy a floor on the crack margin against fuel oil, but would also sell some caps (calls) on the crack margin against fuel oil to generate some cash premium and subsidize/totally net out the cost of the floor crack option. In doing this the refiner would put a limit on the amount of improvement of the crack margin from which it can benefit, but at least the cap can be placed higher than the current swap level. So the refiner would still have more chance to benefit from improvement than if it merely sold the fuel-oil swaps at current market levels.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 14

Key Technical Analysis for Energy Futures Markets

Timing is the key to any successful trading or hedging program. But getting the timing right will always be more of an art than an exact science. However, there are some tools that can help to build up a clearer picture of when the market price trend may change, which in turn should provide an idea of market direction and timing.

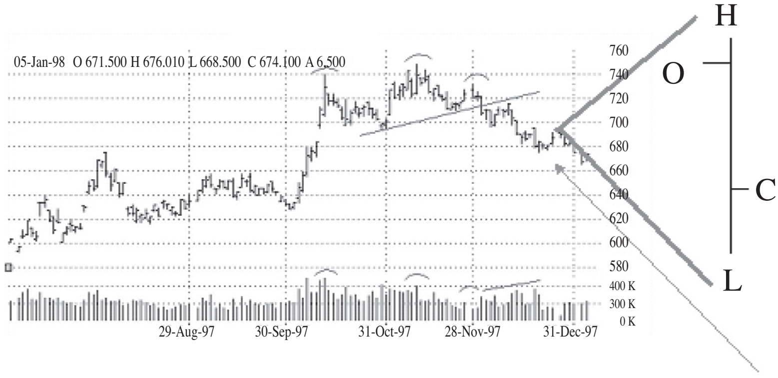
There are two main types of analysis that can be carried out: fundamental analysis and technical analysis. Fundamental analysis deals with the supply-and-demand factors of the physical energy world, whereas technical analysis is concerned with the price history of the market. In reality, most people use a combination of the two — what might be termed "techno-fundamental" analysis. In other words, when a general technical picture of market direction and timing has been established, any new fundamental information can be incorporated into the picture as it is announced.

If a trader starts with a clear technical picture, whenever news or information comes into the market during the trading day, there is a key question to be asked: Is this fresh news or has the market already seen it? This is important because sometimes information or events are rumored in the market and, as the saying goes, people "buy the rumor and sell the fact". This can sometimes lead to a situation in which the market will fall on bullish news or rise on bearish news. In these instances, the news or information was already in the price, so the confirmation of the news gave the signal for people who were speculating on the rumor to take their profit and close out their position.

This chapter presents the key technical approaches and tools that work well together when applied to major energy-futures markets. Note the word "together": technical analysis is a bit like detective work, in that it requires ongoing attention to all evidence that might support any theory on the direction of price trend and the timing of entry and exit.

WHAT IS TECHNICAL ANALYSIS?

Technical Analysis — Bar Chart



A bar chart is the most popular type of chart in the futures markets. It represents open, high, low and closing price of each day in the market, as shown by the expanded version of a bar on the right hand side of this diagram.

FIGURE 14.1 Typical futures bar chart (each bar represents 1 x time period)

In the bar chart shown in Figure 14.1, each bar represents one trading day. Referring to the expanded bar on the right-hand side, each bar represents where the market opened (O) (that is, the first traded price of that day); the top of the bar is the high of the day (H); and the lowest level (L) is the low of that day. The horizontal line on the right-hand side of the bar represents the closing price (last traded price/official settlement price). The arithmetic scale is generally used for constructing bar charts showing price and time. The logarithmic scale is of little use for technical analysis, although it can be useful for bringing different commodities down to the same scale for analyzing which markets are taking the lead in percentage terms.

There are a number of ways of defining technical analysis, but, in a nutshell, it is the study of market prices, with price charts such as that shown in Figure 14.1 being the primary tool. It is based on the idea that historical price movements of a commodity can be used to predict the sentiment and the expectations of market participants with regard to the future price trends.

Another way of looking at technical analysis is to see it as applied social psychology, in that it sets out to recognize trends and changes in crowd behavior. In many ways, technical analysis is all about trying to predict what the majority of traders believe will happen next in the price direction of the market. In fact, one of the main reasons that technical analysis works is simply that everyone believes it works. The majority of people trading in the markets are influenced by technical analysis and so its predictions can be, to some extent, self-fulfilling. It therefore follows that we must examine the key tools of technical analysis on which the majority will be basing their decisions.

One thing is certain: technical analysis can help when making predictions of timing and market direction. However, it is not enough to rely on a single technical tool; a combination of five or six technical tools and approaches is needed to help build up a good picture of market-trend price targets and timing. It should also be remembered that there are certain types of market-price movement that can render some technical-analysis tools too unreliable to follow. The key here is to recognize when such tools should be treated with caution.

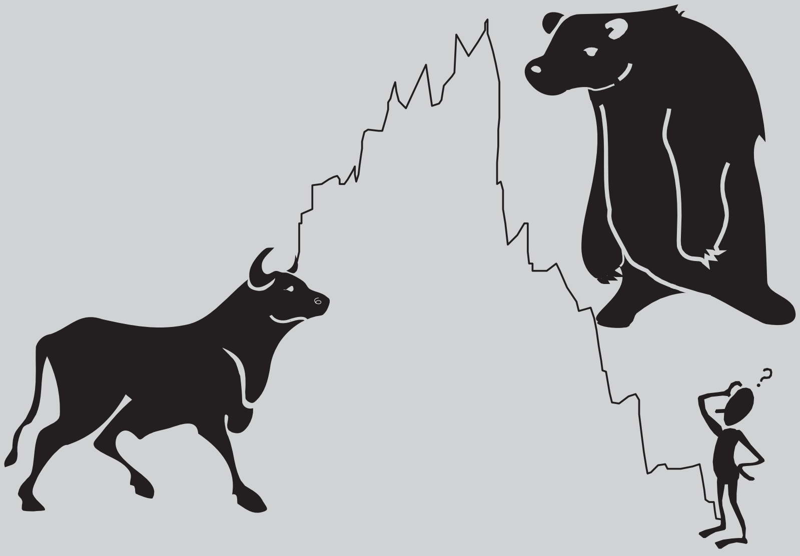
THE PRINCIPLES OF TECHNICAL ANALYSIS

Technical analysis works on a number of key principles:

- That all known market fundamentals (news in the market) is accounted for and is reflected in market prices — that the market has absorbed all the news, and the price represents a consensus on where price should be, based on all known data. This is certainly true in efficient markets which have good trading volume (liquidity).
- That prices move in trends and trends persist.
- That market action is repetitive or cyclical.
- That if we accept the fact that human emotions and expectations play a role in commodity pricing, we should also admit that our emotions play a role in our decision making.

Anyone looking to use technical analysis should keep it simple and use the tools and approaches adopted by most of the world. As this is an exercise in trying to predict what the majority of traders are thinking, it is important to watch the tools that they will be looking at, which in turn will affect their own perspectives on future price trends. It is also useful to refer to news agency reports on the market, as these often discuss technical-analysis tools on the market. You can be sure that these tools will have some bearing on perceptions of future trends.

Bulls and bears



The terms "bull trend" (market moving higher) or "bear trend" (market moving lower) come from the days of the early commodity markets in London. At the time, bull fighting and bear fighting were both popular spectator sports in the city. The terms for the direction of financial and commodity markets are based on the way in which bulls and bears fight. A bull will attack with its horns, pick up its opponent and throw him up in the air; whereas, a bear will stand up on its back legs and drop down on top of its opponent, crushing him with its weight.

THE TECHNICAL-ANALYSIS BAR CHART

- **A history of technical analysis**

The roots of modern-day technical analysis are in the Dow Theory, developed around 1900 by Charles Dow. Stemming either directly or indirectly from the Dow Theory are principles such as the trending nature of prices, prices discounting all known information, volume mirroring changes in price, and support and resistance. Of course, the widely followed Dow Jones Industrial Average is a direct offspring of the Dow Theory.

The price of a commodity represents a consensus. It is the price at which one person agrees to buy and another agrees to sell. The price at which an investor is willing to buy or sell depends primarily on the individual's expectations. If he expects the security's price to rise, he will buy it; if the investor expects the price to fall, he will sell it. These simple statements are the cause of a major challenge in forecasting commodity prices, because they refer to human expectations which, as we know, are not always predictable. This fact alone will keep any mechanical trading system from working consistently.

Because people are involved, many investment decisions are based on criteria that might be considered not strictly relevant. After all, our confidence, expectations and decisions in the market can all be influenced by a large number of factors: relationships with family, neighbors and employer; income levels; previous success and failures — none of which could ever be quantified successfully in a statistically based model.

• Trendlines

Before embarking on any mathematical calculations, there is a lot of information and guidance on future price movements that can be extracted from the basic bar chart, as shown in Figure 14.1.

The concept of trend is essential to this approach to technical analysis. Generally, the trend is simply the direction of the market. More precisely, market moves are usually a series of zigzags, resembling a series of waves with fairly obvious peaks and troughs. It is the overall direction of these peaks and troughs which constitute market trend.

Traders watch for a change in trend and subsequent confirmations of that change before acting on that information. Trendlines play an important part in illustrating that a change has been made and also give traders an indication of the price levels that might trigger a price change or a new buying or selling interest. Trendlines should be drawn off two price points — a high or low and the earliest price points that can be found. The trendline should then be confirmed by a third test as illustrated in Figure 14.2.

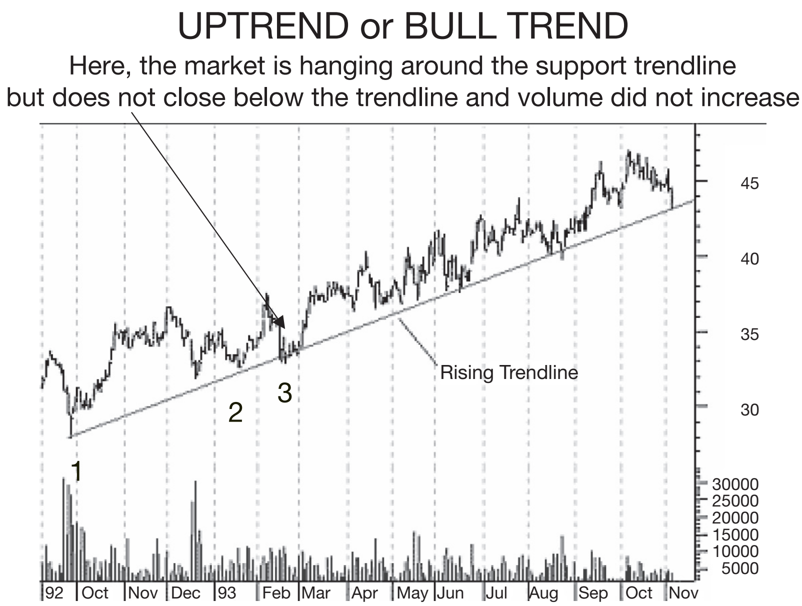


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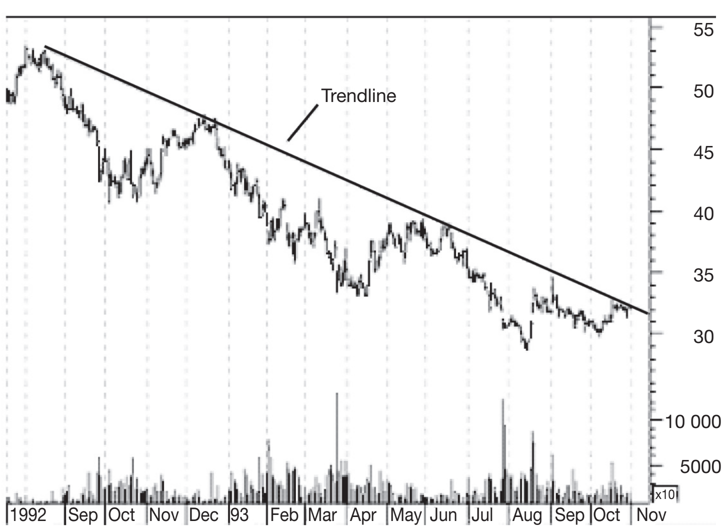
FIGURE: 14.2 Confirming the trend

The rising trendline in Figure 14.2 illustrates a bull trend. A falling trendline, or bear trend, is shown in Figure 14.3.



Source: FutureSource U.K. Inc.©

FIGURE14.3 A bear trend

- **Other notes on trendlines**

The steepness of the trendline is also important. In general, most trendlines tend to approximate to an average slope of 45°. Such a line reflects a situation where prices are advancing or declining at such a rate that price and time are in perfect balance. It is rare to find a trendline which is at exactly a 45°-angle but we can say that, in a bullish market, if the trendline is too steep (above 45°), it indicates that prices are advancing too rapidly and that the current rise will not be sustained. This is illustrated in Figure 14.4: at point [A] the support trendline initially holds as support for the price of the market but is then broken. At point [B] the support trendline holds as support and then resistance, holding the price of the market from moving higher, and then support again (it is quite common for a trendline to offer both support and resistance). At point [C] the resistance trendline then becomes support again for prices a few months later

Source: FutureSource U.K. Inc.©

FIGURE 14.4 IPE Brent Crude Oil: Trendlines

Figure 14.5 illustrates clearly on WTI NYMEX Crude oil a successful test and confirmation of a trendline (shown by line [A]). The market tested three times before finally breaking this resistance trendline on the fourth occasion and rallying quite strongly away from the trendline.

Source: FutureSource U.K. Inc.©

FIGURE 14.5 NYMEX WTI Crude Oil: Confirming the trendline

- **Trendline and breakout**

Figure 14.6 provides another illustration of the breakout exemplified in Figure 14.5.

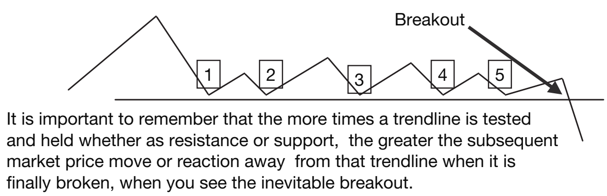


FIGURE 14.6 Breakout

A breakout is where a trendline is finally broken (see Figure 14.4 location [A]), indicating that if good trading volume is seen at the same time, a change in price trend could be taking place. Other indicators help to identify when a trend change may take place, which is usually followed by a break in the trendline, confirming the change.

SUPPORT AND RESISTANCE

Alongside trendlines on charts, clear patterns of support and resistance can also be spotted, as shown in Figure 14.4, where line [A] demonstrated a clear line of resistance to market prices for four months before the market finally managed to break through and move higher. If the energy price is thought of as being an ongoing war between the bull (the buyer) and the bear (the seller), support and resistance levels can then be seen as the battlefields in that war. In other words, support and resistance levels represent barriers to change.

A good way to quantify expectations following a breakout from a trendline or from resistance or support levels is to look at the volume associated with the price breakout. Figure 14.7 shows the relationship between price movements, trendlines, and volume. If prices break through the support/resistance level with a large increase in volume and the move-back is on relatively low volume (resistance becomes support), this implies that the new expectations will rule (a minority of traders are unconvinced). Conversely, if the breakout is on moderate volume and the move-back period is on increased volume, it implies that very few traders' expectations have changed and a return to the original expectations (that is, original price trend) could be seen.

Source: www.globalriskpartners.com

FIGURE 14.7 Resistance/support trendline and volume increase on breakout through the trendline in 1992

VOLUME

Except during major international holidays when little trading is being done, low volume levels are characteristic of indecision or an expectation of possible change. This typically occurs during price consolidation periods — periods when prices move sideways in a trading range. Low volume also often occurs in the indecisive period during market bottoms or tops. Sometimes traders and brokers will refer to the market "bottoming out" or "looking toppy". This indicates that the market may reverse its previous trend.

On the other hand, high volume levels are characteristic of market tops, when there is a strong consensus that prices will move higher. High volume levels are also very common at the beginning of new trends (that is, when prices break out of a trading range). For example, just before market bottoms, volume will often increase as a result of panic-driven selling.

Volume can also help determine the health of an existing trend, by indicating whether it is a strong or weakening. A healthy uptrend should have higher volume on the upward legs of the trend and lower volume on the downward (corrective) legs. A healthy downtrend usually has higher volume on the downward legs of the trend and lower volume on the upward (corrective) legs

OTHER CHARTS

- **Japanese candlestick charts**

In the 1600s, the Japanese developed a method of analyzing the price of rice contracts. This technique is called "candlestick charting". Candlestick charts (see Figure 14.8) display the open, high, low and closing prices in a format similar to a bar chart, but in a way that highlights the relationship between the opening and closing prices. Candlestick charts are simply another way of looking at prices but don't involve any calculations. Candlesticks provide information on their own and also feature in a number of important patterns.

They have their uses, especially for traders in markets such as bonds, but in the energy markets there is only one key formation that is worth looking out for as a possible early warning of a major trend change.

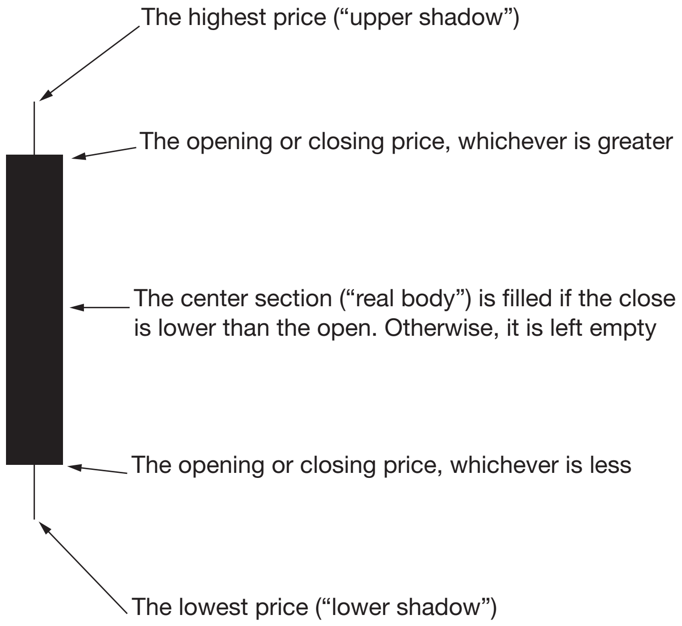


FIGURE 14.8 The Japanese candlestick chart

The feature to look out for in the energy futures markets is called, in Japanese charting terminology, the "DOJI" formation and is illustrated in Figure 14.9. A DOJI forms when a contract being traded has its open and close at virtually the same level.

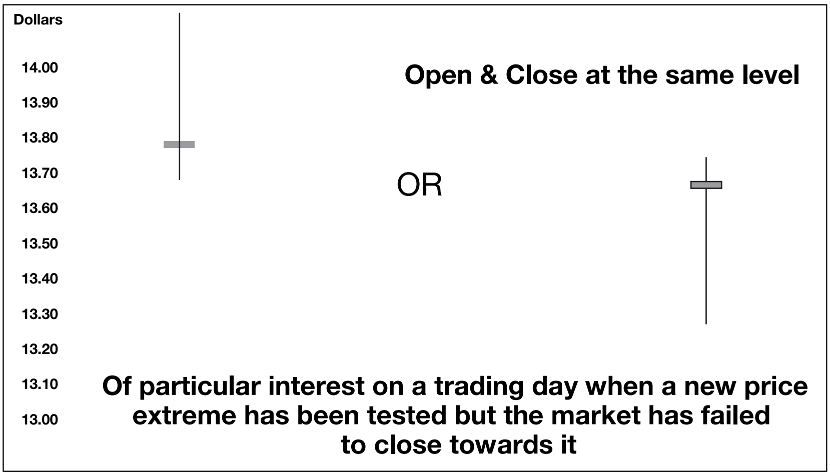


FIGURE 14.9 The "DOJI" formation

I have noticed this "DOJI" formation on three or four occasions over the past seven years, and when it has shown up in NYMEX or IPE Futures contracts, it has been followed by a trendline support break and, in one instance, the market dropped some US$3 a barrel on the IPE Brent in just a few days.

THE VIP RELATIONSHIP (VOLUME, OPEN INTEREST AND PRICE)

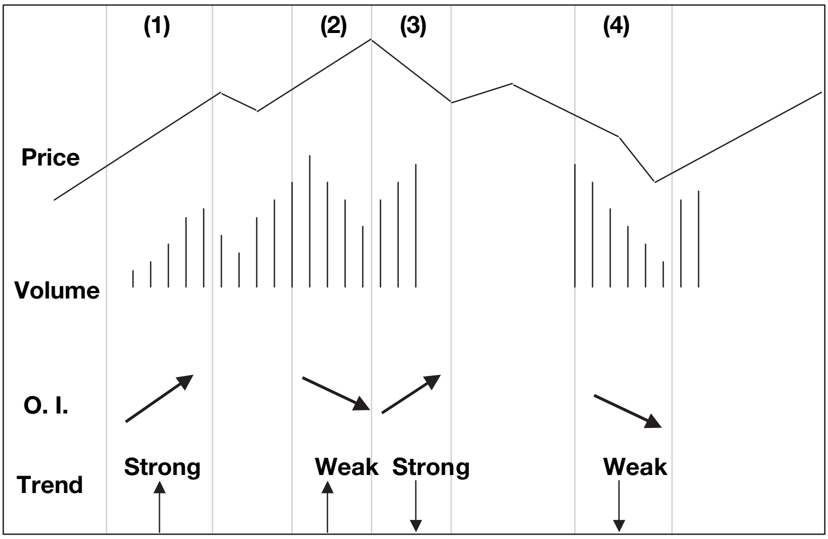
It is possible to build up a good picture of what the market is thinking from a combination of trendline analysis (using charts, support/resistance levels), volume (using the total market volume) and open-interest information.

Volume is a simple but key aid when analyzing the market. It can give a good real-time signal as to the level of interest in a new trend starting or an old trend finishing. This, combined with open interest (which is available in futures markets contracts but not equities), provides a very good combination tool to analyze whether a trend could continue or may be coming to an end (see Table 14.1 and Figure 14.10).

Open interest is the net number of futures or option contracts in existence on an exchange, counting a bought contract and a sold contract as one open contract (a figure of "1" in open-interest terms).

Table 14.1 The VIP Relationship

PRICE	VOLUME	OPEN INTEREST	MARKET IS...
Rising	Increasing	Up	Strong Bullish
Rising	Decreasing	Down	Trend Weakening Watch for Reversal
Falling	Increasing	Up	Strong Bearish
Falling	Decreasing	Down	Trend Weakening Watch for Reversal



(1) The market is moving higher, volume is increasing, open interest (O.I.) is increasing. This shows that the bullish uptrend is well supported with new buyers coming into the market.
(2) The market is moving higher, but volume and O.I. are decreasing. This shows that there is no new interest in continuing the bullish trend and, in fact, with open interest decreasing, the market looks like it is closing out of (selling out of) previously bought (long) positions which could be showing a profit. This market trend is showing signs of weakness, so watch out for a change in direction.
(3) The market changed direction in this example and started moving lower. Volume and open interest both increased, illustrating new selling interest coming into the market, which in turn supported the bearish trend.
(4) The market is moving lower still but on lower volume. Also, open interest is reducing, showing that some players are slowly losing confidence in the current trend continuing. As a result, they are buying back previously sold positions, taking profits and closing out their positions, which is reducing open interest.

FIGURE 14.10 Another example of the VIP relationship

END-OF-TREND SIGNAL

The end of a trend is often signaled when volume becomes progressively smaller each trading day and the price range of trading days (the distance between the high and low price of the day) is also reduced. The period between one trend nearing its end and a new trend starting can be a time when the market is waiting to make a decision on a new trend. The decision is made once a trendline is broken or key support or resistance triggers renewed trading interest with increased volume.

It is also worth emphasizing that a significant increase in volume should always be seen when a trendline or a key support/resistance level is finally broken. If not, then it may be a false breakout. This can sometimes occur when markets are very quiet. Indeed, some speculators may be tempted to force the market on low volume through a well publicized trendline level in an attempt to trigger some reaction in the market.

PRICE GAPS AS PRICE TARGETS

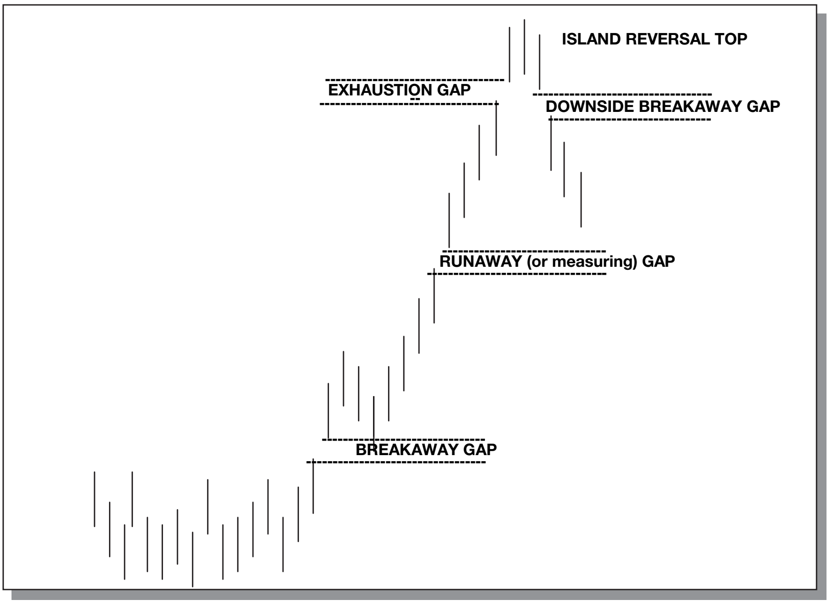


FIGURE 14.11 Price gaps illustrated

Another good way of determining where the market may head is to look out for price gaps on price charts. Energy futures markets often use price gaps as targets. A question many traders ask is how far back in time they should look for price gaps. I have found that on daily bar charts (where each bar represents one trading day) you can often see that price gaps that have occurred as much as three months in the past are still watched by the market. There are different names for price gaps, as shown in illustration 14.11. While in analysis terms the individual meanings of the gaps are similar, the names help describe where they are formed in the price trend; at the beginning — the breakaway gap; during an established price trend — the runaway gap; or the exhaustion gap which, as the name implies, should appear towards the end of a price trend. This is how they would be reported in news reports or analysis reports sent out by brokers.

But price gaps are not just indicators of price targets. They can also indicate whether an old trend is going to start again. This can be seen in the case of a bullish trend, when a market breaks support and then comes down to aim for a price gap. If the market fills the price gap and holds the bottom of the gap (as illustrated in Figure 14.11) then it can be expected that buyers will come back and that the bullish trend will have a new lease of life.

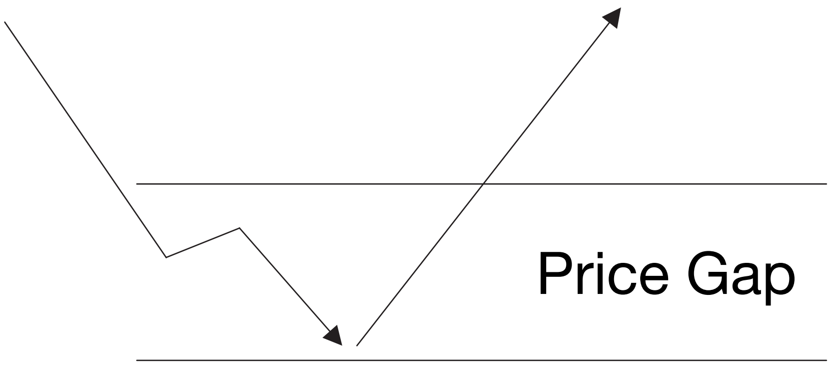


FIGURE 14.12 Illustration of the expected price action after the market weakens to fill a price gap, and then recovers after testing the bottom of the price gap.

In the example illustrated in Figure 14.12, the market has been in a bullish trend, but corrects downwards. The price gap is filled, but the market holds the bottom of the gap to continue the original bullish trend. In a case like this, renewed buying interest can normally be seen.

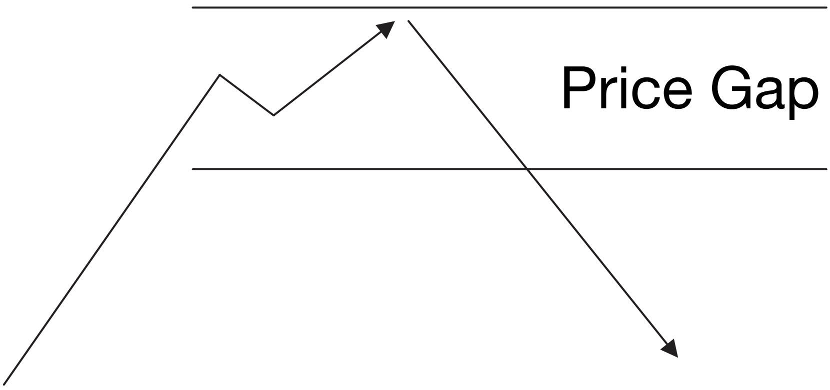


FIGURE 14.13 Example of price gap where market recovers to fill a price gap and then continues in bearish trend.

In the example shown in Figure 14.13, the market has been in a bearish trend and corrects upwards. The price gap is filled, but the market holds the top of the gap to continue the original bearish trend. In this case, renewed selling pressure can normally be seen.

FIBONACCI RETRACEMENT LEVELS

So far we have looked at trendlines which can help to identify trends and establish key support or resistance levels that can highlight a trend being broken. We have seen how volume data, open-interest data and price data (VIP relationship) can give early warnings of trends coming to an end and how much interest there is from market participants to help continue the current trend. We have also looked at price gaps as price targets that give traders an idea of how much the market might move in a particular direction. Another good way to predict price targets is by using Fibonacci percentage retracement.

Fibonacci was the nickname of the thirteenth-century mathematician Leonardo Pisano, who (re)discovered what we know today as the Fibonacci sequence. This is calculated by adding 1+1 and then continuing to add the sum to the previous number to give a numerical sequence (1, 1, 2, 3, 5, 8, 13, 21, 34, 55, and so on).

The ratios of these numbers give us the golden number sequence ratio, or .618. This has been adopted in modern technical analysis as 61.8%, and its opposite as 38.2%.

These Fibonacci numbers are complemented in modern technical analysis with a 50% retracement level. All technical-analysis software packages will draw 38.2%, 50%, and then 61.8% price retracement when Fibonacci retracement is selected. It has been observed that the price trend in a market will often make a 50% price correction before resuming its original price trend. This is not just in commodity markets such as energy: for example, the London stock market crash in the late 1980s was not a crash but a correction. Almost to the penny the FTSE 100 index lost 50% of its value and then started a bull run that would last throughout the 1990s.

The Golden Ratio of 0.618 can be found all around us — from the double helix of DNA to spiral galaxies. The pioneering work of traders such as W.D. Gann (Gann Lines) and R.N Elliott (Elliott Wave theory) also showed that these ratios are prevalent in the financial markets. When properly applied to energy-futures markets, they are surprisingly reliable and the market watches these retracement levels avidly. (For further information, see www.en.wikipedia.org/wiki/Fibonacci_number.)

Energy-futures markets such as IPE and NYMEX tend to reverse or consolidate once they reach one of these ratio levels (measured from the distance of the reversal of previous trends). This means that these levels can be very useful as entry and exit points from the market.

There is a tendency for the markets to retrace down (during a bullish trend) or recover (during a bearish trend) by 50% before continuing the original trend. In the example shown in Figure 14.14, the market retraces 50% then carries on the original bullish trend. Besides this 50% retracement, there are minimum and maximum retracements that should be allowed for: 38.2% and 61.8%, as established from the Golden Ratio of 0.618 and the Fibonacci number sequence, respectively. What this means is that in a correction of a very strong trend, the market may only retrace 38.2% of the previous move. A trader looking for a buying or selling opportunity (depending on the trend) can compute the Fibonacci retracement levels and use them as a reference point to enter or exit the market.

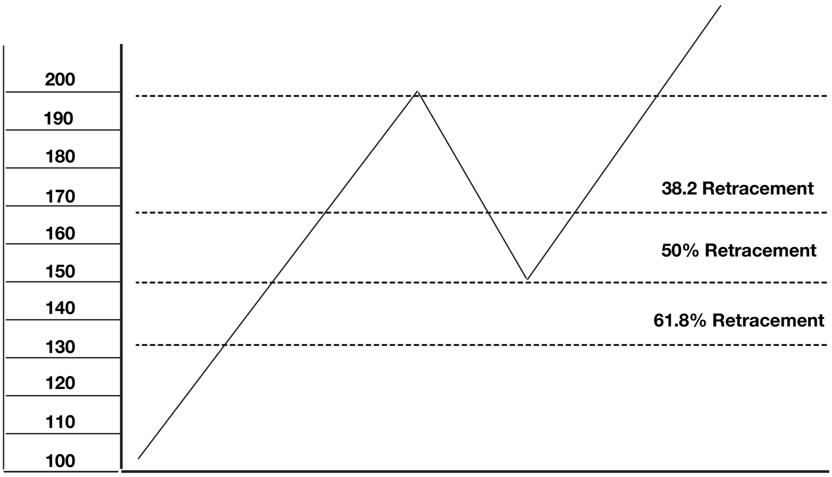


FIGURE 14.14 Example of Fibonacci retracement levels

- **Chart reading**

To identify Fibonacci retracement levels, the most recent highest point and lowest point in the futures chart should be identified.

Most energy futures contracts, after making long sustained moves in one direction will eventually retrace a portion of the move, before continuing on to extend it. Most commercially sold stock-charting software packages will automatically draw in Fibonacci levels between short-, medium- and long-term pivot points using traditional 38.2%, 50%, 61.8% and 100% retracement levels. These levels can be watched as price targets or resistance points when selling (profit-taking on long positions) or, when calculating levels in the opposite (downward) direction, as price targets or support points where short covering (buying back) may occur and fresh buying interest should come in to the market .

In the oil markets, people follow Fibonacci percentage retracements. In fact, this works so well that sometimes the market has been seen to touch the Fibonacci target level exactly and then hold and recover its trend.

MATHEMATICAL INDICATORS

There are many types of mathematical indicators used in technical analysis but here we focus on those that work on a consistent basis for the energy-futures markets. These indicators can give a trader a simple yet very effective tool for building up a view on price direction and timing when used in parallel with bar charts, support/resistance levels, gaps, trendlines, volume and open-interest information.

- **The RSI (relative strength index)**

The easiest way to describe how RSI reflects the market is to say that it treats the futures market price as if it were a rubber band. The rubber band can be stretched just so far but, after a certain point, unless it breaks, it is forced to contract. The idea was developed by J. Welles Wilder and presented in his book *New Concepts in Technical Trading Systems* (1978).

The RSI is a fairly simple formula, as follows:

$$100 - \left(\frac{100}{1 + \left(\frac{U}{D} \right)} \right)$$

Where U = An average of upward price change
D = An average of downward price change

Basically, the RSI equals the average of the closes of the up days divided by the average of the closes of the down days. The timeframe specified determines the volatility of the indicator. Many technical-analysis books and news reports talk about a "nine period", a "14 period" or "a 21 period" time span for analysis. These time periods are usually applied most effectively to daily bar charts; however, the RSI can be applied to longer or shorter periods.

It is probably a good idea to use two RSIs rather than one. Using one short time period in conjunction with a longer time period can help a trader to assess how much an energy-futures market is overbought or oversold. (For energy futures, a three-day RSI and a 14-day RSI is suggested.) "Overbought" means that the market price has moved higher too quickly in the period being analyzed; "oversold" means that the price has moved lower too quickly.

Calculating RSI: For a 14-day RSI calculation, the following are the steps involved:

(1) Add the closing values for the up days and divide this total by 14.
(2) Add the closing values for the down days and divide this total by 14.

(3) Divide the up-day average by the down-day average. This results in what is known as "the RS factor" in the formula.
(4) Add 1 to the RS.
(5) Divide 100 by the number arrived at in (4) above.
(6) Subtract the number arrived at in (5) from 100, to get the RSI percentage.

***14-day RSI*:** If the RSI is over 75%, the futures contract is overbought and it may be difficult for prices to move any higher. Prices should soon correct to the downside more severely than if the three-day RSI were overbought.

If the RSI is below 35%, the futures contract is oversold and prices should find support (that is, the market should find it difficult to move lower). Prices should correct to the upside.

***Three-day RSI*:** This is a very useful short-term entry/exit indicator. If the RSI is over 90%, the market is very overbought and will probably struggle to move higher. It should have a good intra-day correction to lower prices.

If the RSI is below 20%, the market is very oversold and will struggle to move lower. In this case, the market should have a good intra-day recovery to higher prices.

The guiding principle of the combined use of the three-day and 14-day RSI is that if the market is looking overbought/oversold, it is likely that more than just a one-day price correction can be expected. The correction could, in fact, be seen over several days, as shown in Figure 14.15.

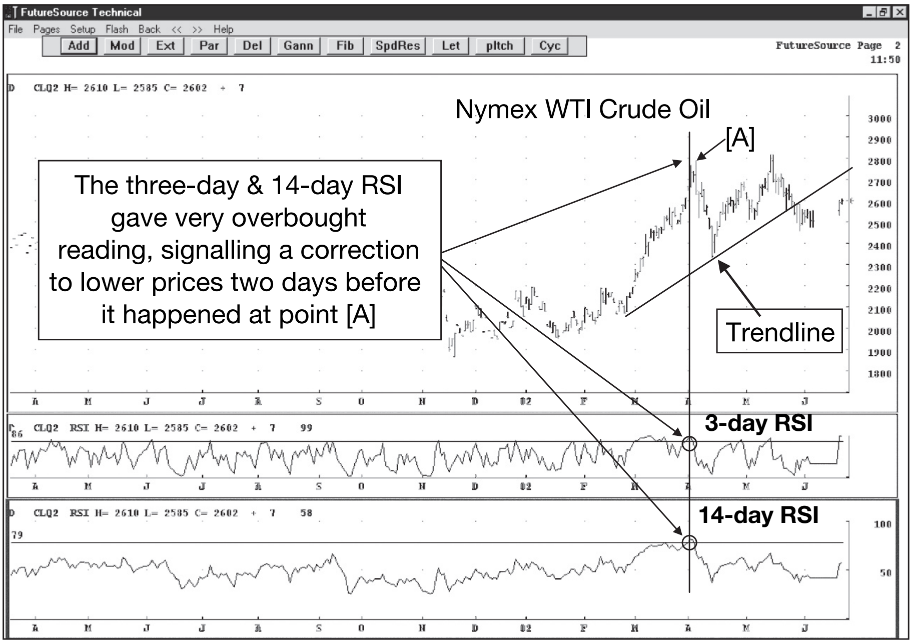


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FIGURE 14.15 RSI illustrated using NYMEX WTI Crude Oil

MOVING AVERAGES

There are three types of moving averages available: simple, weighted and exponential, but the energy markets tend to utilize the simple moving average and that is what we will concentrate on in this chapter. The critical element in a moving average is the number of time periods used in the calculation. In hindsight, it is always possible to find a moving average that would have been profitable.

The 39-week simple moving average has an excellent track record in timing the major (long-term) market cycles. In energy markets, a 13-day moving average based on closing (or last) traded price on daily bar charts gives a very good buy/sell signal.

A 13-day simple moving average (based on last market-close price) can also prove very profitable as a buy/sell indicator for the oil futures markets. It is a Fibonacci number and has been highly publicized in the energy market; plenty of traders watch it closely, so it works.

As with all technical indicators, simple moving averages should never be used on their own as they do have some disadvantages, the obvious one being that it is necessary to wait for the market close to get the final indication whether to buy or sell. However, it can be a very valuable confirmation tool to add to the other indicators in building up a view of the market.

- **Interpretation**

The most popular method of interpreting a moving average is to compare the relationship between a moving average of the commodities price with the price itself.

A buy signal is generated when the security's price rises above its moving average and a sell signal is generated when the security's price falls below its moving average.

This is illustrated in Figure 14.16, which shows clearly when real market buy and sell signals occurred using the 13-day simple moving average on the NYMEX WTI Crude oil futures daily bar chart.

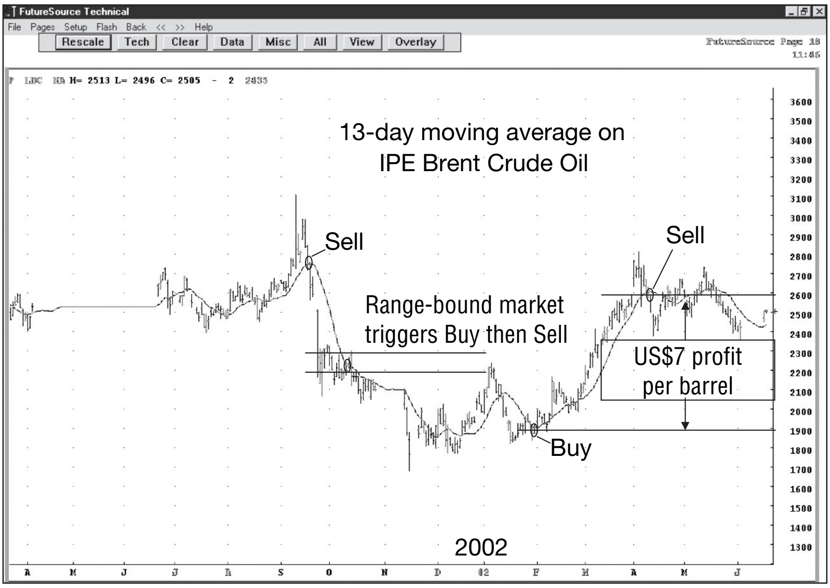

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FIGURE 14.16 NYMEX WTI Crude Oil with 13-day moving-average overlay giving buy and sell indications.

Although they work really well in a trending market, the drawback to moving averages is that they can create false signals if the market is "range bound"; that is, where it is stuck between a particular high price and low price and just keeps trading between those prices, making no real bullish or bearish trend visible. This is illustrated in Figure 14.17.

FIGURE 14.17 A typical range-bound market

Here, the market gets stuck trading between a particular area of resistance and support, as shown by the horizontal lines above and below the candlestick bar chart.

CHART PATTERNS

Chart patterns are formations which appear on price charts of futures contracts (in this context) that can be classified into different categories. The type of pattern observed can provide big clues as to whether the market is going to continue its current price trend or whether it might reverse it. Some patterns will also give a clue as to how much the market may move.

There are two major groups of chart patterns: reversal patterns and continuation patterns. Reversal patterns indicate that a reversal in the market price trend is in the process of taking place. Continuation chart patterns suggest that the market is consolidating — it is resting, perhaps because it was very overbought or oversold (this can be established by referring to the RSI level, as discussed earlier). Once this position has been relaxed, the market will resume its original bull or bear trend.

By examining charts on a regular basis, a trader can develop a professional intuition and observational skill as to which type of pattern is forming. The earlier this can be detected, the better.

- **Triangle formations**

When price fluctuations stay in a trading range and that trading range becomes progressively smaller with the passage of time, a triangle formation occurs.

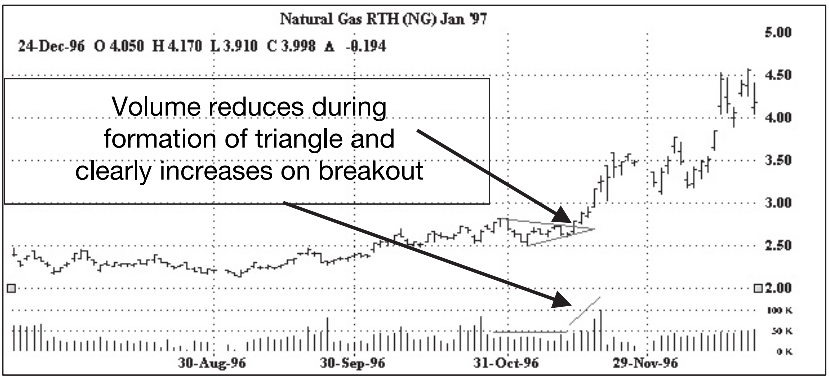
In the formation of a triangle, resistance and support areas are identifiable, as daily fluctuations move towards the apex. Identifying triangle patterns allows for trading opportunity during their formation and after a breakout from the pattern.

Uncertainty is the basis or reason behind why each rally and each sell off has less market commitment. At some point that uncertainty is sufficiently resolved or other factors tip the scales of supply and demand for the general market so that a breakout of the pattern occurs.

A triangle could signal a reversal or continuation of the trend. The general trend of fundamentals and psychological sentiment in the market play an important role in the unfolding of price action and the resolution of such patterns.

During the development of triangle formations, volume should diminish as the price swing narrows within the triangle. The tendency for volume to contract is true of all consolidation patterns. The volume should increase significantly once the market breaks out of the triangle formation. A lack of volume increase may warn that the market is not confident of this market direction. A benefit of the triangle formation is that it gives both an indication of timing when a breakout will occur and also an idea of the direction of that breakout.

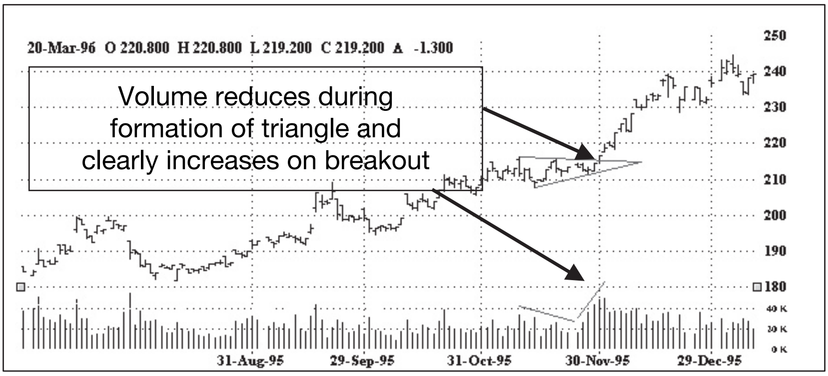
A symmetrical triangle in the beginning of an uptrend (continuation pattern) signals that a bigger uptrend is still to come. In Figure 4.18, notice the reduction in volume during the formation of the triangle and the sudden burst of volume trading activity on the breakout.



Source: FutureSource U.K. Inc.©

FIGURE 4.18 Symmetrical triangle in the beginning of an uptrend in Natural Gas RTH

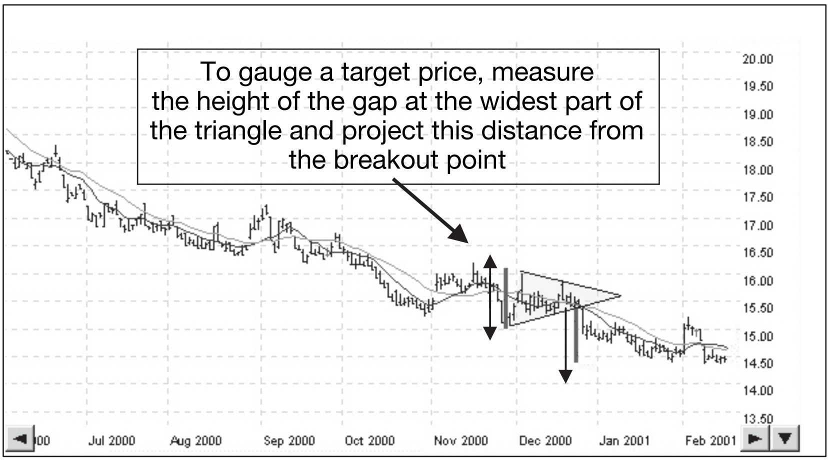
A symmetrical triangle in the middle of an uptrend (continuation pattern) signals a bigger uptrend still to come (continuation pattern). In Figure 4.19, notice the leveling of the volume during the formation of the triangle and the burst of activity on the breakout.



Source: FutureSource U.K. Inc. ©

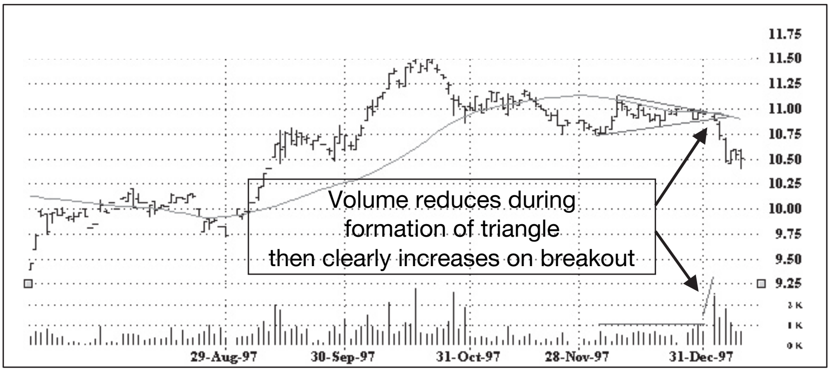
FIGURE 4.19 Symmetrical triangle in the middle of an uptrend

Triangle formations give us not only an indication of a continuing trend but also an indication of a price target. The following charts contain some real-life examples that will aid readers to spot these trends during their research and analysis of the markets.



Source: FutureSource U.K. Inc.©

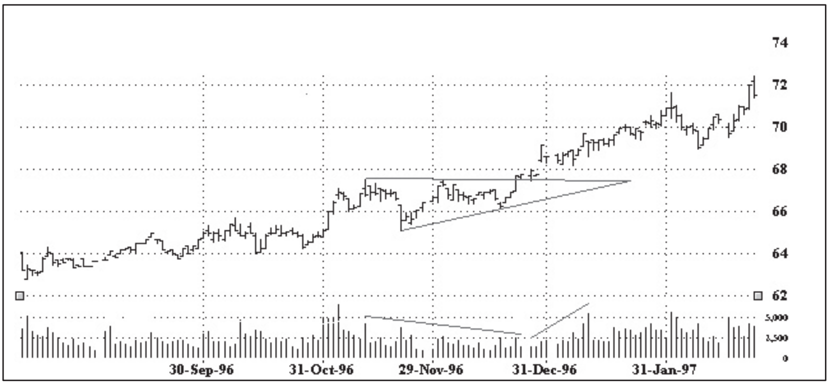
FIGURE 14.20 A symmetrical triangle in downtrend (continuation pattern)



Source: FutureSource U.K. Inc.©

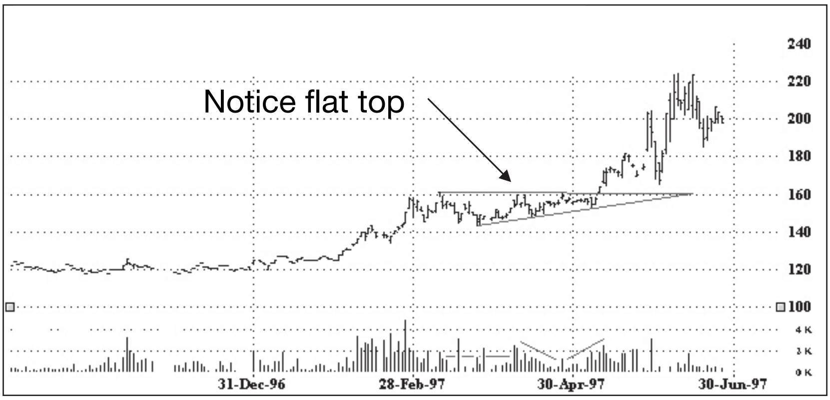
FIGURE 14.21 A symmetrical triangle in the beginning of a downtrend (continuation pattern)

An ascending triangle in an uptrend (bullish continuation pattern), as illustrated in Figures 14.22 and 14.23, shows volume falling off during the formation, then picking up and expanding on the breakout and subsequent upward movement.



Source: FutureSource U.K. Inc.©

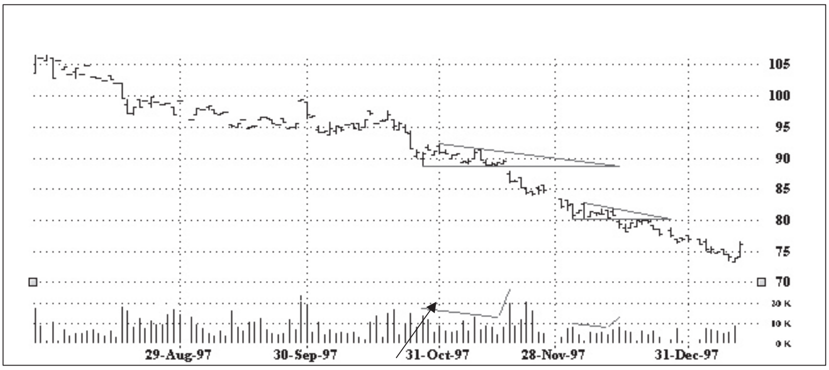
FIGURE 14.22 An ascending triangle in an uptrend (bullish continuation pattern)



Source: FutureSource U.K. Inc.©

FIGURE 14.23 Another example of an ascending triangle in an uptrend (bullish continuation pattern)

Figure 14.24 provides a clear example of two descending triangles in a downtrend (bearish continuation pattern). Notice the clear volume patterns that take place during the breakouts. Volumes increase noticeably, confirming the breakout and continued trust of the bearish trend.



Source: FutureSource U.K. Inc.©

FIGURE 14.24 Descending triangles in a downtrend (bearish continuation pattern)

The falling wedge in a downtrend (bullish pattern), as illustrated in Figure 14.25, was able to reverse the downtrend nicely. Note how the volume dropped off in the wedge and then came back as the market moved out of the pattern.

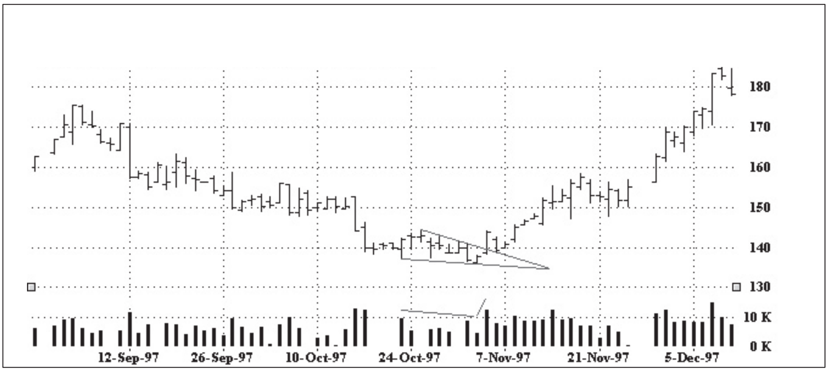
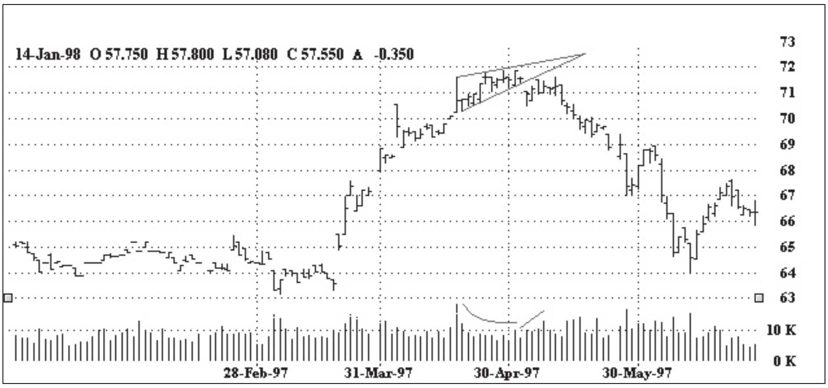


FIGURE 14.25 Falling wedge in a downtrend (bullish pattern)

Figure 14.26 provides a great example of another type of triangle formation — a rising wedge pattern. The volume of the market tails off as the trend struggles to continue. Finally, volume expands as the market falls through the bottom of the wedge and the new downtrend begins. This rising wedge seemingly represented an area of indecision. The market made its decision and collapsed over the course of the next month.



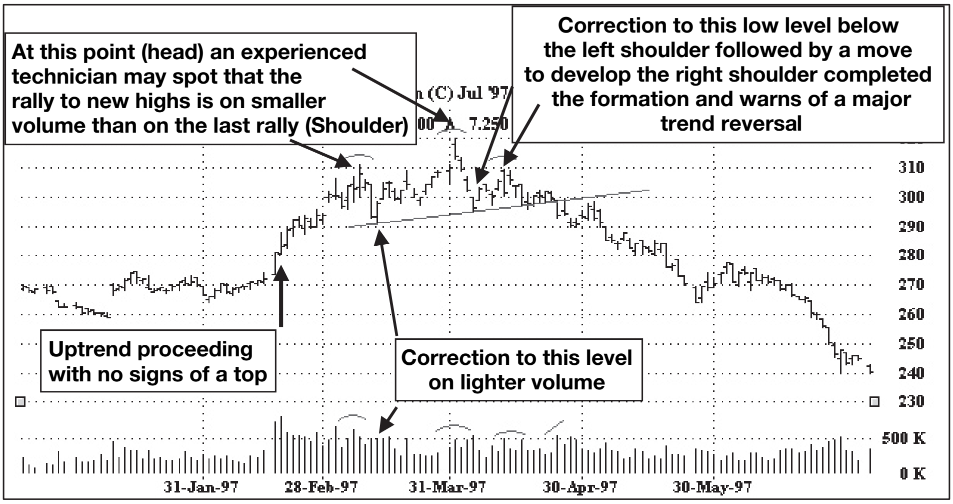
Source: FutureSource U.K. Inc.©

FIGURE 14.26 Rising wedge (bearish pattern)

- **The head-and-shoulders (reversal pattern)**

This is probably one of the most difficult chart patterns to spot, but it is a clear signal of impending change. Apart from being one of the more complex chart patterns, it is probably one of the best-known and most-reliable reversal patterns.

In Figure 14.27, eventually the market begins to slow down and the forces of supply and demand are generally considered in balance. Sellers come in at the highs (left shoulder) and the downside is probed (beginning neckline). Buyers soon return to the market and ultimately push through to new highs (head.) However, the new highs are quickly turned back and the downside is tested again (continuing neckline). Tentative buying re-emerges and the market rallies once more, but fails to take out the previous high. (This last top is considered the right shoulder.) Buying dries up and the market tests the downside yet again. The trendline for this pattern should be drawn from the beginning neckline to the continuing neckline. (Volume has a greater importance in the head-and-shoulders pattern than in other patterns and generally follows the price higher on the left shoulder. However, the head is formed on diminished volume, indicating that the buyers aren't as aggressive as they once were. And on the last rallying attempt — the left shoulder — volume is even lighter than on the head, signaling that the buyers may have exhausted themselves.) New selling comes in and previous buyers get out. The pattern is complete when the market breaks the neckline. (Volume should increase on the breakout.)



Source: FutureSource U.K. Inc.©

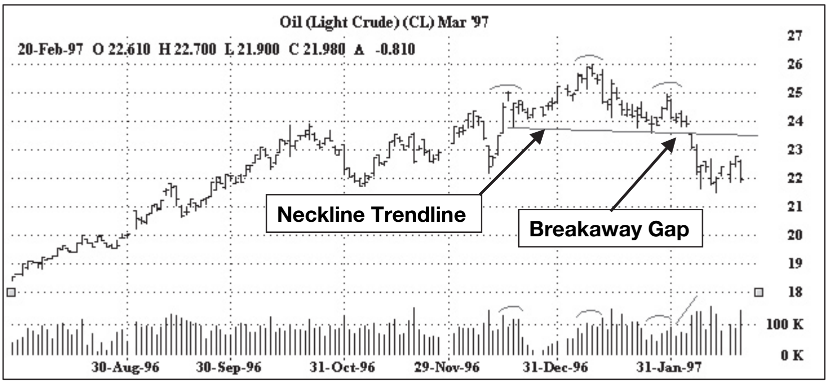
FIGURE 14.27 Head-and-shoulders reversal pattern

NOTES ON HEAD-AND-SHOULDERS FORMATIONS

The left and right shoulders should be about the same height; most importantly, the right shoulder should not be above the left. The head should be higher than both shoulders. Volume should be declining during the formation of this pattern.

The neckline can be drawn from the lows made after the formation of the left shoulder and the head. Once this neckline is broken, the formation is completed. This formation gives an idea of market direction and also an idea on price targets. A trader can take the distance from the head to the neckline and project this downward from the point that the neckline was broken to give us an indication of price target.

In the oil markets, though, the head-and-shoulders pattern has been seen to work except that only about 75% of the price target was reached. This is fairly common and a lot of people watch out for the formation so that many traders pre-empt and trade ahead of the price target being reached.



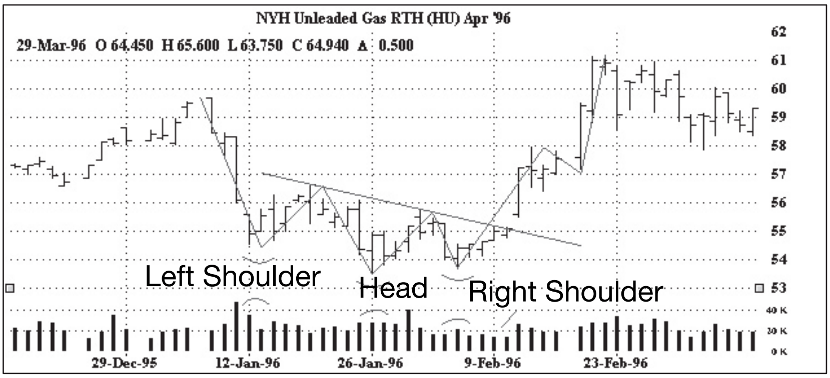
Source: FutureSource U.K. Inc.©

FIGURE 14.28 Crude oil head-and-shoulders reversal pattern reversing a one-year bullish trend

In the NYMEX WTI Crude Oil Futures Market, illustrated in Figure 14.28, this technical move even had a "breakaway gap" (refer to price gaps earlier in this chapter for more details) which triggered even more aggressive selling pressure than a mere break of the "neckline", the trendline that accompanies the head-and-shoulders pattern.

- **Inverted head-and-shoulders (reversal pattern)**

The inverted head-and-shoulders pattern illustrated in Figure 14.29 reversed a minor downturn in NYMEX Unleaded Gasoline Futures and there was even a breakaway gap, showing real momentum for the new uptrend. Volume increased on the breakout of the neckline trendline.



Source: FutureSource U.K. Inc.©

FIGURE 14.29 Nymex Unleaded Gasoline contract with inverted head-and-shoulders pattern

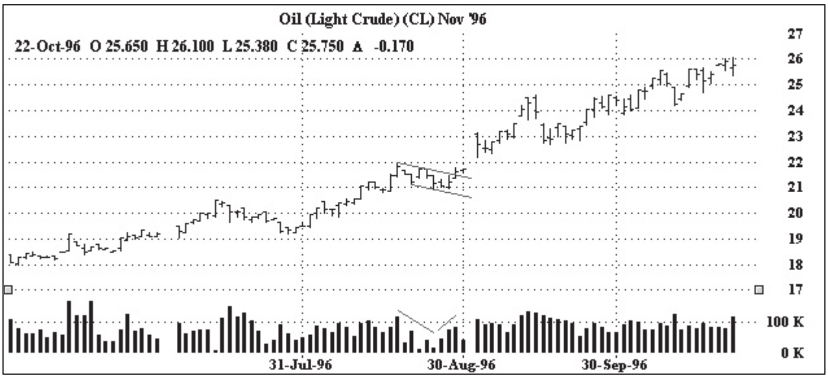
THE FLAG FORMATION

Another common chart formation to watch out for in the oil futures markets is the flag formation. The flag represents a brief pause in a large market move. In fact, one of the requirements for the flag is that it is preceded by a sharp and almost straight-line move. It represents situations where a steep advance or decline requires a pause, before running off again in the same direction.

The flag should slope against the trend. Volume should reduce during the formation and build up again on the breakout. The flag usually occurs near the midpoint or halfway mark of the move, as illustrated in Figures 14.30 and 14.31.

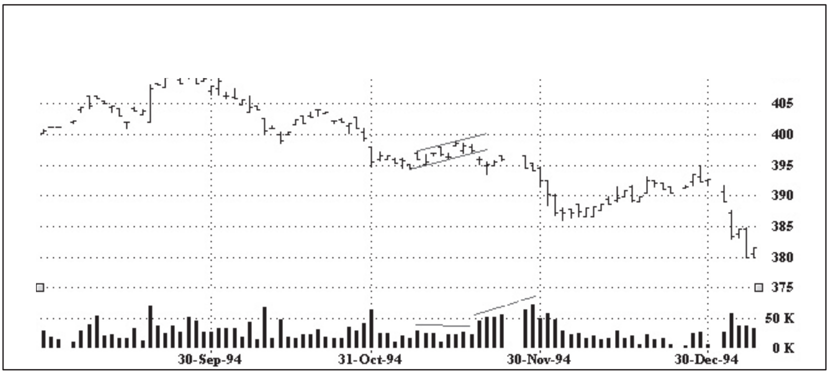
- **Bull flag in an uptrend (halfway mark)**

This chart pattern, illustrated in Figures 14.30, indicates that the trend has only reached half of its potential. The market could be consolidating as a result of RSIs being overbought before carrying on with its trend.



Source: FutureSource U.K. Inc.©

FIGURE 14.30 NYMEX WTI crude futures: bull flag in an uptrend



Source: FutureSource U.K. Inc.©

FIGURE 14.31 Bear flag in a downtrend (halfway mark)

PENNANTS

Pennants are a continuation pattern. In Figure 14.32, the bullish pennant is preceded by a bull trend. In Figure 14.33, the bearish pennant is preceded by a downtrend. The large volume increase on the breakout of the pennant shows confidence and support for the bearish trend.

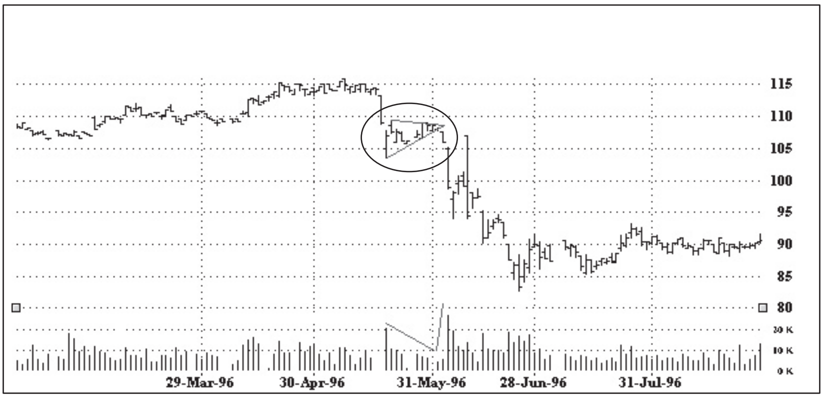
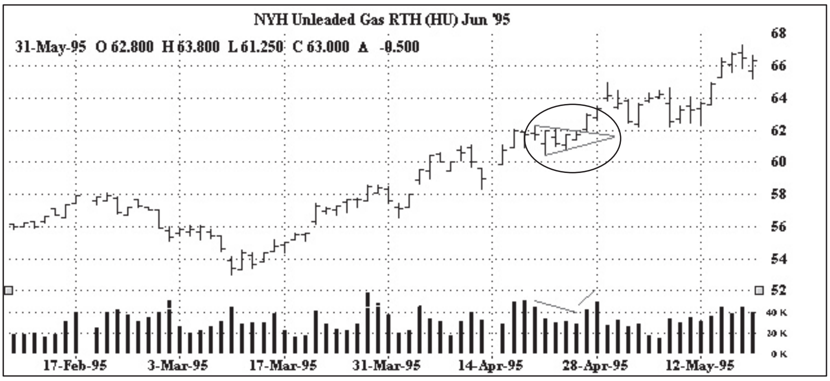


FIGURE 14.32 NYMEX gasoline futures showing a pennant formation (circled)



Source: www.tomjames.org

FIGURE 14.33 Pennant continuation pattern

DOUBLE TOPS AND BOTTOMS

The failure of prices to exceed the previous peak, followed by a downside break of the previous low, constitutes a downside trend reversal. This is illustrated in Figure 14.34. The double-top formation forms a barrier for the market to test at some stage.

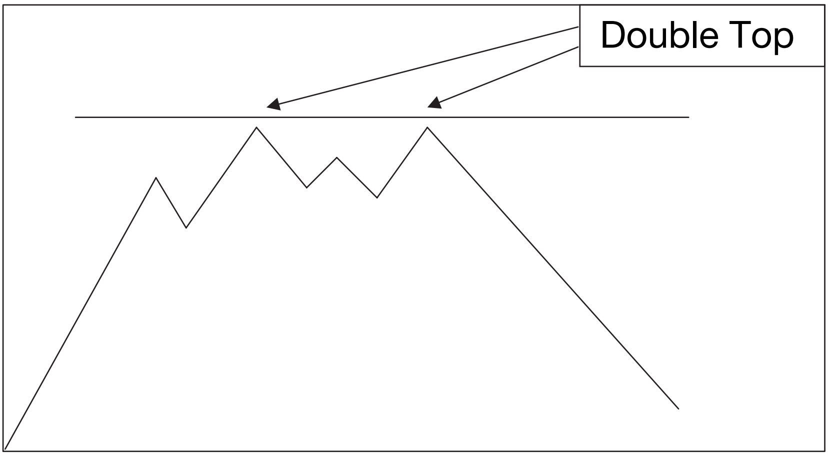


FIGURE 14.34 A double-top formation

Usually, the first sign of a bottom is the ability of prices to hold a previous very recent low. This is then confirmed once recent resistance is broken. Volume should look to increase and the speed of the market moving away from the bottom should increase, confirming the strength of the market. A bottom reversal pattern is illustrated in Figure 14.35.

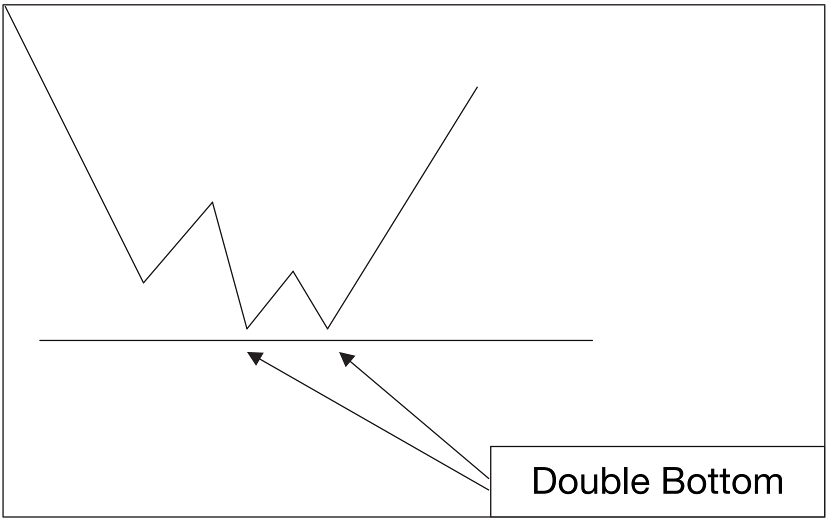


FIGURE 14.35 A double-bottom formation

SUMMARY

There are many tools that can be used for technical analysis and it is important that they be used in combination with each other. But even if the five or six most appropriate analytical tools have been chosen to study the prevailing conditions, the results may still not always prove utterly reliable. The truth is that in the real world there are some days when technical factors drive the market and others when it is driven by fundamentals.

The key is to identify and keep asking the same questions over and over again: What is driving the market — technical factors or fundamentals? Is there fundamental news which has not yet been absorbed by the market price or, in turn, by the technical analysis? Successful traders know that important fresh news will always be in the price before it turns up in the charts.

Last but not least, technical analysis is an art form, not an exact science; it requires practice and patience. The more time you spend looking at charts trying to spot patterns and conducting analysis on the markets, the better you will become. There is no easy or quick way to learn how to spot chart patterns except through practice and time. I hope that this chapter at least provides a good reference point to double-check the patterns you observe in the energy markets.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 15

Operational Risk and its Management

Until the year 2000 the management of energy-price risk was focused mainly on market risk, liquidity risk and credit risk. But over the past few years, there has been a new focus on operational risk, particularly after some big failures in the financial commodity markets.

So what is operational risk? I describe it as the risk of loss caused by failures in operational processes or the I.T. systems that support them, including those adversely affecting reputation, legal enforcement of contracts and claims.

Most organizations can be affected by operational risk in a number of ways, both directly and indirectly. Direct financial losses can be caused by a lack of operational capability to transact business. For example, losses could result from a fire at an organization's offices, or from a back-office computer system being unavailable as a result of a hardware failure. An error in a transaction can also lead to direct losses: if it loses the data that proves a deal has been transacted, the company may be exposed to market price movement and lose money in this way. Indirect losses may be the result of damage to an organization's reputation or client relationship. For example, if a broker has an online trading system which breaks down, this could lead to both a direct revenue loss and an indirect loss as customers lose confidence in the system and don't return to use it again.

KEY COMPONENTS OF OPERATIONAL RISK

- **Core operational capability**

The most obvious kind of operational risk concerns the risk of loss or damage to an organization's core operational capacity. This can be the result of a number of events, including damage caused by fire, bombs, technical problems or all manner of natural disasters; loss of utilities such as power, water or transportation; loss of key operational personnel; and inadequacy, or loss, of systems capabilities arising, say, from computer viruses.

- **Human risk**

People are a company's most important resource, but because it is difficult to apply a mathematical model to measure the risks of human error they have often been overlooked when evaluating operational risk. However, it is possible to make a brief list of the most probable reasons for human error. Such a list might include a lack of integrity and honesty; a lack of segregation of duties and the risk of collaboration; a lack of professionalism; a lack of teamwork and respect for the individual; over-reliance on a few key individuals who may go on holiday or be sick at crucial times or who may leave the company altogether; and insufficient skills, training, management or supervision.

Human error continues to be the major contributory factor to many dramatic corporate failures. For this reason, it must be targeted, despite the difficulty of measuring it. It is certainly a common cause of problems in the back office, so a well-designed system and a process of internal control to pick up on any input errors quickly will save a lot of time chasing problems later on.

- **Transaction-processing systems**

The quality of data is crucial in risk management. Any sound risk-management program relies heavily on accurate, prompt and efficient capture of trade data and the creation of management reports from processing this data.

The most important areas to look at in evaluating risks associated with a transaction-processing system include processes associated with the execution of trades; trade capture (sometimes referred to as "data capture") and the processing of data; trade confirmation (contracts); and settlement operational risk.

Here, settlement operational risk is different from settlement risk. Settlement risk is associated with the credit risk of a counterparty — the risk that someone may not pay up on a settlement of a trade. Settlement operational risk, on the other hand, focuses on losses that can be caused by errors in the settlement process. Figure 15.1 illustrates the key facets of a typical derivatives transaction processing environment and the key operational risks (OR).

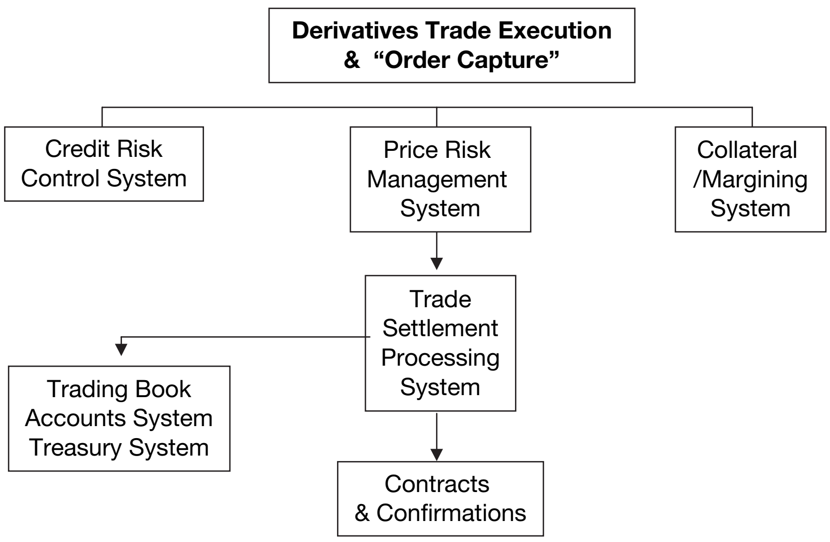


FIGURE 15.1 Typical derivatives transaction processing environment

- **Reconciliation and accounting**

A well-structured back-office system that is integrated with an accounts system is crucial for managing risks associated with reconciliation and accounting. It is important for treasury or accounts people to have at least read-only access to back-office transaction data in order to anticipate any foreign-currency requirements against derivatives margin payments or realized losses on hedges, and to allow them to ensure that adequate risk management on forex hedging is carried out. The reconciliation of settlement data with funding and accounting results is also a key process in protecting the user of derivatives against undisclosed positions or undisclosed losses within its organization.

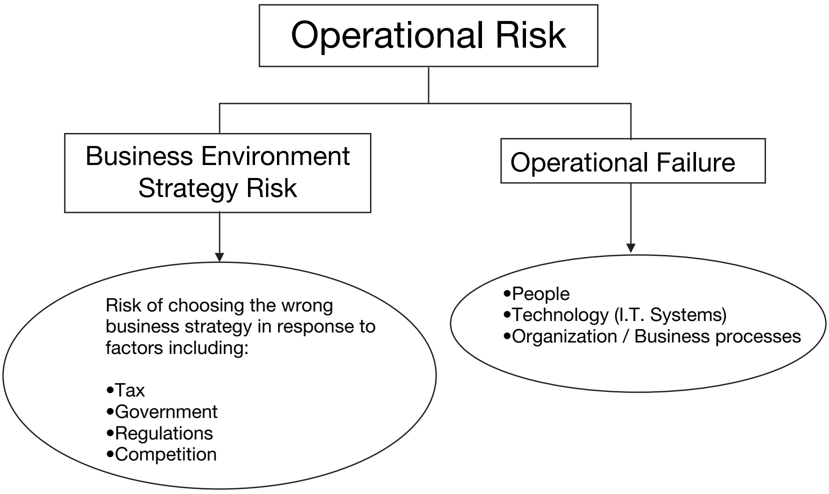


FIGURE 15.2 Illustration of typical operational risk within a firm

Areas that may contain operational risk include:

- ***Process risks***: marketing; selling; new customer; trade execution/processing error; trade fraud; contract/trade recapping; product complexity
- ***Human/people risks*****:** fraud; collusion to commit fraud; unauthorized use of information; rogue trading; staff competency/skill sets; over-dependency on a few key personnel; health and safety matters
- ***Technology risk (process risk)*****:** data corruption (accidental or deliberate); programming errors; viruses; telecommunication failures; system capacity; system failure; strategic (for example, the system provider goes bankrupt and cannot provide further support); security breach (for example, external hacking)
- ***External business environment risk*****:** external supplier; physical security; compliance; money laundering; tax; financial reporting/accounting standards; natural disaster — fires, floods and other weather conditions; strikes — transportation problems; legal risk (litigation); terrorist threat

ASSESSING AND CONTROLLING OPERATIONAL RISK

The core objective of an operational-risk program should be to avoid financial and non-financial losses arising from operational risk failures.

To achieve this, the program should enable the organization to anticipate risks through more efficient and effective measurement and reporting of operational risk using the following five-step approach.

- **Step 1: Identify the risks**

An organization must identify its operational risks by looking closely at the tasks and processes undertaken in the course of its day-to-day trading and business operations.

- **Step 2: Assess the risks**

The operational risks need to be categorized in terms of the possible severity (for example, if the core risk-management system went down, how long it would take to get a back-up system running) and probability of such risks actually happening.

- **Step 3: Assess possible risk-control measures**

The company should list the operational choices open to it to help reduce the identified operational risk. The four main control choices are as follows:

Avoid the risk: Totally avoid the business activity that is creating the risk.

Transfer the risk: A prime example of this is where a firm takes out "rogue trader" insurance. This transfers the operational risk of fraudulent trading into a credit risk with the counterparty to the insurance policy. Insurance is a key way to transfer a large majority of operational risks.

Reduce the risk: Changing the way business is conducted (referred to by experts as the "transaction chain") can help to reduce risk. The other key way is by allocating more cash or capital to systems and human resources through providing skills-training updates and more personnel to cover risk areas.

Accept the risk: Research may show that the probability of a particular operational risk event occurring is so remote that the company decides just to accept the risk. This normally happens when the cost of implementing new procedures or systems far outweighs the risk to the company.

- **Step 4: Execute control measures**

If action of some kind is taken, someone needs to follow up and make sure that implementation of new measures is executed correctly.

- **Step 5: Create supervisory role(s) to monitor the ongoing risk**

A supervisory role needs to be established. The person(s) responsible for the operational-risk program should write progress reports and comparative studies on any reduction of losses associated with operational risk, to illustrate the effectiveness of the program. Management should discuss these reports and if no appropriate response is taken to any risk event, they should, of course, create some strategy to prevent it occurring again. Operational-risk programs should also be reviewed regularly (probably at least twice a year) to accommodate any changes in external business environments, the general business activities of the company and the size of those activities.

GATHERING INFORMATION ON OPERATIONAL RISK

It is essential that organizations gather as much information as possible on operational risks. This can be done by interviewing business and operational line managers, who may reveal concerns over potential operational risks that could occur unless action is taken. The following company reports and documents should also be reviewed with operational risk in mind:

- Management reports (These may have highlighted operational problems and issues in the past.)
- Budgets
- Business plans
- Operations plans
- Disaster recovery plans (If an organization does not have one, this is an immediate source for operational risk — business recovery.)
- External reports
- Audit reports (Increasingly, financial auditors are looking at operational risks in an organization that may add potential points of failure. Rating agencies also focus on operational-risk issues when assessing a company's credit rating.)
- Any regulatory reports

- Historical data on losses (especially in transaction errors etc. where losses were posted against specific operational failures).

A simple yet effective approach to put operational risk data in an understandable format is shown in Figures 15.3 below.

Monthly Risk Report Example (incorporating OR)		Page 1
Losses	Current Month	Year to Date
Operational losses		
Credit losses		
Market losses		
Sub Total:		
Loss/revenue ratio:		

Monthly Risk Report Example (incorporating OR)		Page 2
Risk Events		
Event	Exposure	Response
1 IT System Failure	Lost revenue of US$2m	New backup system put in place
2		
3		
4		
5		
6		
7		
8		

FIGURE 15.3 Gathering and reporting operational-risk data

RISK REDUCTION, CONTROL AND CONTAINMENT

- **Risk reduction**

In any operational-risk program, the first step that should be taken is to reduce the risks inherent in the organization's business processes. Wherever possible, the retyping of data by human operators should be eliminated from the process. This can be done by integrating existing IT systems or investing in new ones. Hiring additional staff will also help to reduce dependency on key individuals and reduce the pressure on understaffed areas of the business.

- **Risk control**

Appropriate preventative measures can be taken to minimize the chances of an operational risk occurring. For example, operational risk could be controlled by introducing or improving firewalls, passwords and authorization processes surrounding trading. Internal audit checks can be introduced and control functions can be assigned to staff with specific responsibility for maintaining control standards.

- **Risk containment and transfer**

Tightening up procedures and investing in IT systems, automation and staff will certainly reduce an organization's operational risk. But such risks can never be completely eliminated, which means that it is also important to have ways of containing those operational risks that still remain.

Obviously, companies can buy insurance against loss of revenue from fire, flood or other natural disasters at their premises, thus transferring operational risk over to a credit risk of the insurance company. It can also look at recovery procedures and business continuity planning in the event of a computer failure. For trading companies, this could entail setting up a hot back-up site to which staff could move in the event of the primary office location becoming non-functional. The importance of this was seen in the aftermath of 9/11 when the World Trade Center was destroyed. A lot of businesses grounded to a halt as financial markets closed, but companies still had to process trades from around the world and keep their back offices running. This they were able to do by activating their back-up sites.

TRENDS IN OPERATIONAL PROCEDURES

Many financial institutions have already adopted automation to tackle human error by implementing what is known as "straight-through processing" (STP). STP, at its most integrated level, allows a derivative trade to be executed by a trader on an electronic trading platform and for the information to feed from there directly into the organization's back-office and administration systems. This eliminates the need for repeated manual typing of trade data, an area of consistent problems for operational risk.

SUMMARY

The term "operational risk" covers some of the most serious and dramatic risks that an organization can face: for example, natural disasters, fraud and failures of technology. It might seem that there is little a company can do to plan for such unexpected catastrophes. However, an assessment of operational risk and the development of appropriate systems can go a long way towards controlling and reducing it. An assessment may also show that where risks cannot be controlled, they can be contained by measures such as the adoption of insurance cover.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 16

A Practical Guide to Credit Control and Risk-Mitigation Methods

The collapse of Enron in 2001 taught the energy-trading industry an expensive lesson: that while the energy industry may be the lifeblood of the hydrocarbon-powered global economy, credit is the lifeblood of the energy industry. Keeping a strong credit rating should be central to an energy firm's goals. It is fair to say that since the collapse of Enron far more energy companies have been managing their credit lines in similar ways to banks, by stressing the role of margining.

Further emphasis has been placed on credit risk by the bull run in energy and commodity prices seen since 2002 through to 2007, with oil prices holding their position in high US$60 price ranges. The higher oil price and increased volatility witnessed in recent years has put strains on credit-line availability and cash liquidity in energy-trading companies and consumers of energy.

For example, an airline buying jet fuel when crude oil was trading at US$30 a barrel at the turn of this century was then, within 18 months, confronted with prices of US$50 that rose quickly thereafter to US$70. This hurt budgets and cash flows alike, as costs doubled.

In this chapter I review some of the methods, established and new, that corporations have at their disposal to manage credit-risk exposure effectively.

Enron never had a particularly good credit rating but its standing in the market was as a key player; companies in the energy markets had to be able to trade with Enron. This often meant that energy players were forced into a position where they had to take larger credit risks than they might have normally with a BBB+ rated entity; otherwise, they would lose profitable trading opportunities. The advent of Enron

Online made it even more difficult for energy-market participants to have any chance of avoiding credit exposure with Enron.

What is quite stunning and also rather unnerving was the speed at which Enron, a company held in high regard by the energy market, went from BBB+ to Chapter 11 in the few short weeks between 15 October and 3 December 2001.

Countdown to Enron's Collapse

15 October: Enron releases earnings, announcing a US$2.2 billion equity write-down, including US$1.2 billion stemming from the erroneous accounting of various financial partnerships.

16 October: Rating agencies re-affirm Enron's BBB+ rating. The Standard & Poor's (S&P) press release states:

> The equity account reductions will have no direct effect on Enron's cash flow. However, the company's financial flexibility may be impaired because of the decline in Enron's equity value, which could lead the company to rely more on debt for its future financing needs. Capital expenditures over the near to medium term are manageable and can be financed out of operating cash flow, which will ease any liquidity concerns and help maintain credit quality. Asset sales, such as the recently announced Portland General Electric Co. deal, should therefore be fully available to enable Enron to strengthen its balance sheet and other credit measures in a timely manner.

25 October: Enron's BBB+ rating holds but rating agencies revise the outlook for Enron to negative.

The S&P press release states:

> Despite the negative outlook, several factors supportive of Enron's credit quality have been sustained throughout the uncertainty surrounding the company. The fundamental strength of Enron's energy marketing and trading franchise has remained steady. Standard & Poor's has detected no lapses in the company's risk management practices and trading discipline. No significant deterioration in trading volumes or willingness of counterparties

> to transact with Enron has been revealed to Standard & Poor's in contacts with major energy market participants.

1 November: S&P lowers Enron's rating to BBB and places it on CreditWatch Negative.

The S&P press release states:

> The downgrades indicate Standard & Poor's determination that Enron's plan to employ asset sales and other means to repair its damaged balance sheet will be insufficient to restore its long-term credit quality to the historical triple-B-plus level. The negative CreditWatch listing recognizes the uncertainties that surround the company and its credit quality in the short run due to the possibility of further unanticipated developments in the capital markets.

8 November: Enron files an 8K with the SEC disclosing the severity of the non-cash impact to earnings (cumulatively restating earnings going back to 1997 by approximately $600 million), and the negative impact on its balance sheet from the effects of various financial vehicles that should have been consolidated in its financial statements pursuant to GAAP. Following Enron's 8K filing, Dynegy publicly confirms that it was discussing a possible business combination with Enron.

9 November: S&P lowers Enron's rating down to BBB– and retains its CreditWatch Negative status.

The S&P press release states:

> The Enron downgrade is prompted by the credit implications of the company's restatement of financial statements going back to 1997 due in part to a legal and accounting review of certain related-party transactions by a special committee of Enron's board of directors. The investment-grade rating is predicated on the prospect for improvement of credit quality with the acquisition by the financially stronger Dynegy and the near-term liquidity enhancement, through the injection of $1.5 billion of equity capital, that came with the signing of the merger agreement.

19 November: Enron's 10-Q filing is made, disclosing a ratings trigger event (at BBB–) involving the acceleration of a US$690 million note to 26 November 2001 from 2003.

21 November: Dynegy issues statement on the Enron merger status.

28 November: S&P lowers its Enron rating to B– and places the rating on CreditWatch Developing.

The S&P press release states:

> The rating action is based on Standard & Poor's loss of confidence that the Dynegy merger will be consummated. The willingness of Dynegy to complete its planned acquisition of Enron has been compromised by the continued drop in confidence in the capital markets that the transaction would hold. The market reaction has spread to the energy markets, where Enron's trading and marketing franchise has, in Standard & Poor's opinion, sustained significant damage that, together with rising potential legal liabilities, weakens Dynegy's commitment to purchase Enron.

30 November: S&P lowers Enron's rating to CC and places the rating on CreditWatch Negative.

The S&P press release states:

> The rating action reflects Standard & Poor's expectation that following the dissolution of Enron's announced merger with Dynegy Inc., burdensome debt restructuring requirements, negligible liquidity, and limited access to capital will likely cause Enron to seek bankruptcy protection. The change in CreditWatch implications to negative reflects Standard & Poor's belief that such a filing in the very near term is probable.

3 December: Enron's rating lowered to D following its filing for Chapter 11 bankruptcy protection the previous day.

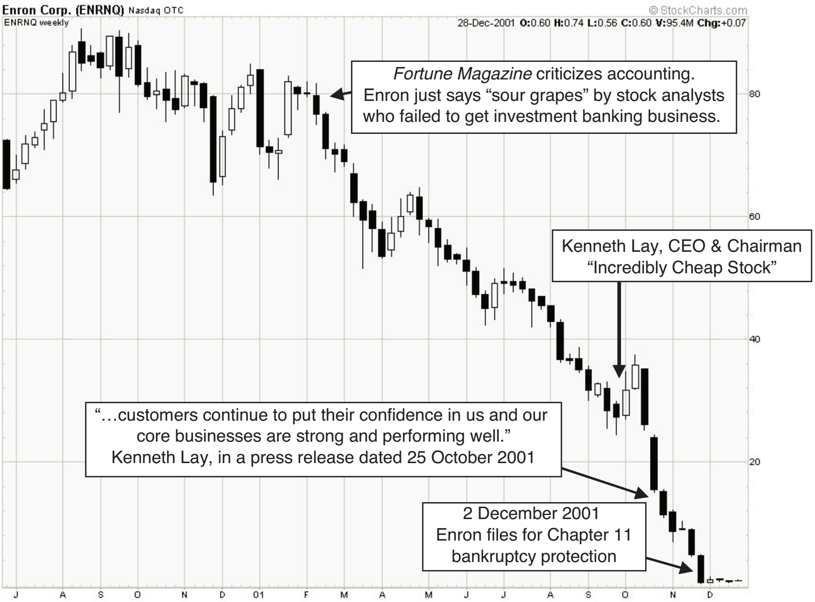


Chart data courtesy of www.StockCharts.com ***Text by Tom James***

FIGURE 16.1 The collapse of Enron stock leading up to its bankruptcy announcement

METHODS FOR MANAGING CREDIT-RISK EXPOSURE

- ### Master netting

This low-cost method is discussed in more detail later in this chapter.

- ### Collateralization

Collateralization of credit exposures in the OTC derivatives market has increased rapidly in recent years and most dealers now collateralize such exposures to some degree. Dealers use collateral to mitigate their credit exposures and thereby engage in more transactions than would otherwise be possible. Collateralization agreements are now usually documented under ISDA's credit support annex, which is added to an ISDA master agreement between two counterparties. This provides for collateralization of the net current exposure on the portfolio of transactions covered by the ISDA master agreement. Again, the cost entailed in this is low.

- **Financial guarantee**

In the energy markets this is normally in the form of an Irrevocable Standby Letter of Credit from the other counterparty.

It is sometimes possible to buy silent guarantees where, for example, counterparty "A" concerned with the credit of counterparty "B", goes to a bank and buys cover against counterparty "B" defaulting (this is usually priced like a letter of credit risk). The cover is normally against a specific exposure — for example, a particular swap or energy contract. In a silent guarantee, counterparty "A" pays for the guarantee and counterparty "B" never knows that "A" has bought this protection; hence the term "silent guarantee".

The cost of this approach varies and depends on the tenure of the deal, the credit quality of the counterparty and the size of the deal (in U.S. dollars).

- **Credit insurance**

This method transfers counterparty credit risk to an insurance company. It provides partial coverage, and a long lead time on payout (30–90 days, or longer). The organization claiming against the insurance usually has to exhaust other routes of getting its money back before the insurance will pay out. Terms and conditions of credit insurance may also include a lot of provisions against which the insurance will not pay out.

The cost of such insurance varies but this method is usually cheaper than credit derivatives. However, in practice, credit derivatives are seen as having much more transparency in the events that trigger payout. It is not easy to obtain credit insurance against derivatives deals. Credit insurance is more suited to "nuts and bolts" transactions such as physical energy assets — for example, a specific oil cargo or energy-supply contract.

- **Credit derivatives**

These transfer the credit risk from the counterparty with which you have that risk (as a result, say, of trading an OTC oil swap contract) to a new counterparty which has a stronger credit rating (the issuer of the credit derivative to you). This is covered in detail later in this chapter.

The cost involved in this method varies, but it is reputed to be more expensive in its basis point equivalent charge than credit insurance. However, there are very clear trigger events for payout: even with the collapse of Enron, the credit derivatives paid out monies owed almost immediately, whilst credit insurance claims either ended up in court or were disputed for many months.

- **Assignment**

This is not very common. It involves the assignment of an OTC derivatives deal to a third party. The industry did see this happening in the Enron collapse where Enron, in an effort to reduce its net loss exposure to the energy industry, assigned profitable swaps in its trading book to third parties with whom it had loss-making swaps positions. The tricky thing here is that it requires the consent of the other original counterparty to the deal, which has to accept the credit risk of the new third party which takes over as counterparty to the deal.

This method is also difficult to administer, requires approvals and can sometimes (depending on the jurisdiction of the counterparties involved) create tax liabilities. This may be the biggest cost of using this alternative.

- **Clearing OTC energy derivatives**

This reduces credit risk and transfers the credit risk by novating a trade (transferring the buy and sell of an OTC trade to a clearing house) to a highly creditworthy clearing house, which then becomes the central counterparty to both the buy and sell of the OTC transactions. Several initiatives have been launched in this area by the London Clearing House (www.lchclearnet.com), the New York Mercantile Exchange (www.nymex.com), the Intercontinental Exchange (www.theice.com) and, in 2006, Asia Clear (www.asiaclear.com.sg) launched by the Singapore Exchange.

The cost of this method is higher than the other routes and not all OTC energy derivatives are supported by clearing houses.

WAYS TO REDUCE CREDIT RISK VIA THE ISDA SCHEDULE

- **Trading before an ISDA is agreed**

Although many dealers aim to complete a master agreement before executing their first derivatives deals, many energy traders sometimes undertake trades with new counterparties before signing a master agreement (although this is increasingly uncommon because it entails increased credit risk for a firm). The failure to complete a master agreement prior to trading can exacerbate credit risks by jeopardizing a dealer's ability to close out transactions and net obligations in the event of a default by the counterparty. However, a properly completed ISDA Agreement can really help to reduce counterparty credit-risk exposure. Close-out netting provisions in ISDA agreements are powerful tools for mitigating credit risk. A master agreement typically provides that, in the event of a counterparty default, the non-defaulting counterparty can accelerate and terminate all outstanding derivatives transactions and net the market values of those transactions so that a single sum will be owed by, or owed to, the non-defaulting counterparty. Legally enforceable netting provisions can reportedly reduce aggregate counterparty credit exposure by between 20% and 60%, which is good. Whether a netting provision in an ISDA agreement is enforceable will depend on the jurisdiction of the counterparty in default. The ISDA spends a lot of time and resources obtaining opinions on the enforceability of its agreements and netting provisions. The Association regularly updates a list of countries for which it has received netting opinions (see www.isda.org), but it is up to each counterparty to interpret the opinions themselves.

- **Reducing credit risk via the ISDA Master Agreement & Schedule**

The ISDA Master Agreement and Schedule were discussed in much more detail in Chapter 12. However, it is worth highlighting here some of the specific ways in which the ISDA Schedule can be used to advantage in reducing possible credit risk.

(The following all refer to the ISDA Schedule and 1992/2002 ISDA Master Agreement.)

- Specified Entities

Under Section 5 of the ISDA agreement (events) the other counterparty's affiliates or group of companies can be added as "Specified Entities"

- Threshold Amount/Cross Default

In the ISDA schedule it is a good idea to put in place (where appropriate in the wording of the contract) a low threshold amount for the other counterparty to the ISDA Schedule. A low threshold dollar value means that the defaulting counterparty's affiliates (Specified Entities) do not have to default on much (for example, loans or other deals, perhaps) before breaking the dollar-threshold level and triggering a default. This event then allows the non-defaulting counterparty to terminate all deals under the ISDA Schedule.

- Collateral/credit support in ISDA Schedules.

Choose to take collateral in the form of Irrevocable Standby Letters of Credit, which are very popular in the OTC Swaps trading arena (they are as good as cash), or cash. If other forms of collateral are accepted (bonds or gold, for example), you should allow for the possible cost of selling these assets to get your cash back and also the possible price volatility of these assets. In banking terminology, a "haircut" is applied to the collateral (for example, for bonds you might only take 95% of the face value of the bond into account).

Credit-support documents could be a parental guarantee for subsidiaries which, on a standalone basis, may represent too big a credit risk. U.S. companies frequently give parental guarantees against their overseas subsidiaries. The majority of trading companies will not highly capitalize their overseas trading operations; rather, for control purposes, they support the company via parental guarantees or by securing banking facilities for the subsidiary by giving them access to standby letters of credit. Funds may be received more quickly under an Irrevocable Standby Letter of Credit since no proof is needed — it is simply submitted to the bank branch. Obtaining funds under a parental guarantee will take longer and require a lot more paperwork.

The ISDA Master Agreement gives strong protection to users. The addition of some of the measures touched upon in this section will further strengthen the credit risk benefits of trading under an ISDA legal framework.

Beyond simple ISDA-based netting of derivatives transactions, some companies are now working on "master netting agreements" (sometimes in liaison with ISDA). This nets financial and physical deals between different energy types/commodities, contract types and even across affiliates and subsidiaries. This is something not practiced widely yet, and, in the case of American companies, there is still a lack of a clear opinion providing for netting of physical and financial deals in the U.S. bankruptcy code.

Given tight credit and the cost of credit in the energy sector, anything that frees up capital and trading lines to permit more business is good for the industry and master netting agreements will no doubt be pursued by more counterparties in the future.

COLLATERALIZATION

Credit-exposure reductions can also be made via collateralization of trades. In the energy-derivatives industry most counterparties who require collateral will request Irrevocable Standby Letters of Credit (this form of collateral having already been listed in the credit-support annex to their ISDA Master Agreement or other master agreement form).

Unfortunately, this is not very efficient and such letters can also be expensive, and difficult to modify and distribute. The wording and procedures of letters of credit (LCs) were built to cover specific trade-finance exposures which do not change (for example, if a cargo of crude oil is purchased at a cost of US$15 million, the payment can be covered by an LC). This type of document, though, is not very well suited to covering derivatives exposures which change daily, and amending letters of credit is time-consuming. Some banks have created specific LCs with flexible wording in an attempt to give cover on the daily variable exposures of unrealized/realized losses on OTC swap positions. However, some of these have paid out up to 10 times the amount for which they were originally issued. There are also some legal issues over whether this type of LC could really be tested in a court of law in forcing a bank to pay out more than the stated face value. Commercially, though, the bank may wish to try to accommodate the counterparty when it tries to draw more than the face value in order to avoid loss of face and loss of future business.

• Collateral requirements

The size of collateral required will depend on whether the trader requiring it has also granted some unsecured credit line to the other counterparty. However, if we can take an example of a first-tier market-maker bank supplying a fuel-oil swaps hedge to a shipping company, it would typically require collateral of at least 10% of the notional value of the transaction. Usually this collateral would take the form of cash or a letter of credit.

The Bank for International Settlement (www.bis.org) states that a bank's internal cover against commodity derivatives exposures should not really exceed 10% of notional. However, most internal risk models used by banks create a capital charge of around 6–8% of notional on trade date. The capital charge can be compared to the initial margin charged by a futures exchange when a trader opens a futures position. There are some instances of a few very conservative banks using an add-on methodology and charging 15% of notional value for deals of one to 12 months forward plus the marked-to-market fair value of the contract re-valued on a daily basis.

Following is an example of a Standby Letter of Credit with flexible wording on value of the LC against an OTC derivative position. The wording is typical for an LC issued by banks against their customer's OTC swap exposure with another counterparty.

TO: XYZ BANK LTD

We hereby open our irrevocable standby letter of credit no.12345 dated 10 August 2007, as follows:

Applicant:	ABC SMALL TRADER LTD
Beneficiary:	XYZ BANK LTD
Amount:	US$100,000 (United States Dollars One Hundred Thousand only)
Expiry Date:	10 AUGUST 2007

Available for payment at our counters at sight against presentation of the following documents:

[A] Copy of Telex Invoice showing actual settlement amount or marked-to-market exposure calculation.

[B] Beneficiary's statement signed by authorized signature reading as follows:

"We, XYZ BANK LTD, certify to you that the amount covers the outstanding amount due to us by ABC SMALL TRADER LTD pursuant to the following paper swap transactions:

1. Contract Ref: 12345abc

Deal Date:	26 June 2007
Product:	Singapore HSFO 180 CST
Quantity:	5,000 MTS Exactly
Fixed Price:	US$134.50 Per MT
Floating Price:	From and including 1 – 31 AUGUST 2007

Special conditions:

1. Multiple/partial drawings are permitted.

2. All banking charges at Beneficiary's bank for Beneficiary's account. All Bank charges at Opener's Bank for Opener's account.

3. The amount of this Standby Letter of Credit is automatically adjusted for any increase/decrease in the marked-to-market exposure calculations (including adjustment for any increase to any amount in excess of the amount initially available and payable under this standby letter of credit) without further amendment on our side.

GUIDELINES FOR TAKING COLLATERAL FROM COUNTERPARTIES

- **Financial instruments used as collateral**

Where a financial instrument is used as collateral, market practice suggests that most firms apply one or more "haircuts" on its value to reflect market and Forex risk. This offers protection if it is necessary to liquidate the financial instrument to realize the cash against a loss.

The purpose of the haircuts is to protect against price declines during the holding period, as well as the costs likely to be incurred in liquidating the collateral. Haircuts are typically expressed as a percentage deducted from the value of the collateral. The level of haircut required will be determined by the organization itself in accordance with its specific needs, but Table 16.1 can provide a useful starting point.

Table 16.1 Suggested collateral haircuts

	< 5 year	> 5 year
Cash	0%	0%
Sovereigns rated AA and above (1) (2)	0.5%	1%
Other investment grade sovereigns	2%	5%
Non-investment grade sovereigns	10%	15%
Corporates rated A and above (1)	7%	10%
Corporates (BBB) (1)	10%	15%
Non-investment grade corporates	20%	25%
Equity main index:		
– Investment-grade issuers		20%

– Others		30%
Precious metals		10%
FX Haircuts: – In major currencies (3) – In others		 5% 10%

(1) Or equivalent
(2) Sovereigns are broadly defined to include supra-nationals
(3) A major currency is a floating currency, following the International Monetary Fund approach

The use of financial assets not covered in this table should be reviewed by supervisors as part of Pillar II.

Source: ISDA Report

CREDIT INSURANCE

The insurance market also has some solutions for transferring credit risk. However, the clarity of payment triggers is not always very clear. Credit insurance is usually limited to trade-credit insurance against physical trade and it is very difficult to find insurance cover against credit default on derivatives positions such as swaps and options. It is more suited to general cover with a counterparty which has a regular flow of physical energy. Users of insurance should pay attention to indemnity clauses, default triggers and liquidity. Unlike Standby Letters of Credit, where a beneficiary simply applies to the bank for the funds without having to prove the monies owed, insurance will normally require quite a bit of documentation. In addition, a beneficiary will normally have had first to exhaust all normal methods of trying to recover the monies owed before applying for payout from the insurance policy. Payouts on a default usually take 30 to 90 days, so there is a cash-flow risk for the beneficiary to consider as well. However, payout on default via insolvency or Chapter 11 can be much quicker because the fact that a company has gone into bankruptcy is a matter of public record; payout for this type of default can be within one to 10 days.

For more information on credit insurance, see www.eulerhermes.com/
Information on bunker fuel-supply insurance can be found at
www.bunkerinsure.se/

THE NEW TOOL OF THE TRADE — CREDIT-DEFAULT SWAP (CDS)

A credit-default swap (CDS) is the most straightforward type of credit derivative. It is a contract that transfers credit-default risk from one party to another. In a nutshell, one counterparty is selling insurance and the other counterparty is buying insurance against the default of the third party. The buyer of a CDS pays a premium to the seller, usually in the form of a basis-point charge (like an interest rate) per annum on the notional of the contract.

A payment is due to the buyer when there is what is termed a "credit event", of which there are three main types: bankruptcy; restructuring; and failure to pay.

If no credit event takes place, the buyer of the CDS pays the basis-point charge on the notional cover from the contract to the seller. Say, for example, that US$10 million CDS against XYZ Bank Ltd costs 95 basis points (0.95% per annum charge); the buyer would pay US$95,000 per year for this cover of US$10 million. If XYZ Bank actually triggers a credit event, the CDS will cover the buyer for US$10 million of credit default. This process is illustrated in Figure 16.2.

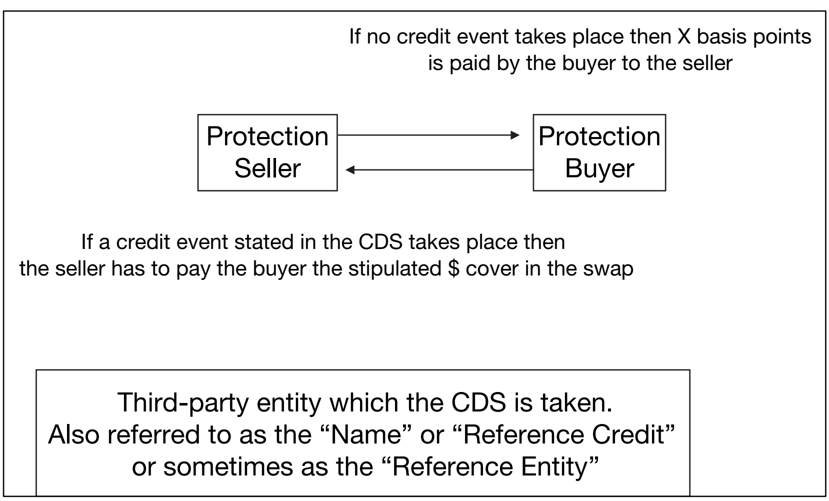


FIGURE 16.2 Credit-default swaps

In a CDS the buyer of protection ("Buyer") typically pays a periodic fee in exchange for the seller of protection ("Seller") contracting to make a payment should a pre-agreed corporate or sovereign ("Reference Credit") suffer some kind of pre-agreed credit crisis ("Credit Event").

The use of credit derivatives is broadly divided between risk management and investor applications. Their use in risk management applies to situations where the user is a buyer and is looking to reduce credit exposure (although not necessarily motivated entirely by risk reduction). Investor/trader applications apply where the user is a seller and wants to increase its credit exposure.

With a CDS, even if you have a portfolio of credit risk with investment-grade firms, you may have a large percentage of that risk with just a handful of firms. Part of any credit policy should be to spread risk and have limits on any one counterparty or group of companies. The most commonly used credit derivative is the CDS on either a single company (also referred to in the credit market as a "name") or a basket of names. In the latter case, a company could use a CDS as a general credit-risk hedge against a portfolio of regular credit risk that it takes in the energy market.

In this chapter, we will focus on the use of the CDS for the purposes of risk reduction and for managing credit lines.

- **Risk reduction through CDS**

The most obvious and common use of a CDS is to reduce credit risk in a situation where the user is concerned for the quality of the credit being hedged. This could arise where some commercially negative news about a reference credit (name/entity) has been released by newswires and the organization with the exposure chooses to hedge actual exposure. Speculative traders may buy a CDS to take a negative position on a particular sector, region or specific entity's creditworthiness becoming worse.

- **Managing credit line through CDS**

The CDS is often used to reduce credit exposure in a situation where the user is very positive about the credit quality of the credit being hedged, but, due to factors such as internal limit issues, there is insufficient credit line to allow a planned transaction. A prime example of where this happened is that of Petronas, the Malaysian State oil company, which is a very actively traded CDS. However, the company has a very high rating and solid financial foundation and trades very actively in the energy markets with many counterparties. So the CDS is used to manage the credit line of the borrower in question and the need for a hedge arose because of a positive view of the reference credit and the need to free up some more credit to enable more trading.

In the following example (Figure 16.3), company "A" sells 500 megawatts of electricity per month to company "B". This costs company "B" about US$1 million per month. In order to mitigate the risk it has against a credit default by company "B", company "A" enters into a credit-default swap with a CDS provider. The CDS will involve periodic payments being made to the swap provider for the credit protection given through the swap structure. Typically, this payment would be made up of a credit spread plus other costs. If company "B" has a rating of BBB and the CDS counterparty (the provider) is a AA-rated bank, the credit spread would be derived from the difference in the rating of BBB against AA. Other costs might include the cost of funding and the capital cost from the use of the CDS provider's balance sheet.

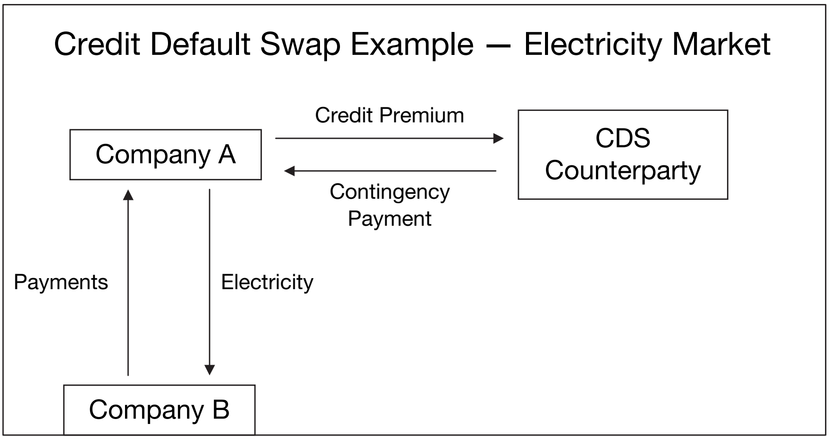


FIGURE 16.3 Credit-risk flow example

OBSTACLES AND LIMITATIONS: COUNTERPARTY CREDIT RISK

The transacting of a CDS often suffers from the so-called credit paradox, whereby credit risk can never be totally eradicated.

Credit risk from credit derivatives can appear in the following ways.

1. A protection buyer creates a counterparty credit risk with the CDS seller. More often than not, an organization using credit-default swaps may be able to spread its credit risk better by reducing overall

exposure to any one entity or sector. A trader in the energy sector is going to be exposed to a lot of energy traders, but by using the CDS approach some of this credit risk might be transferred to the credit risk of banks or investment funds which are market-making in such swaps. Note the use of the term "transfer": the trader does not eradicate credit risk altogether but shifts some of its energy-sector exposure over to the financial/banking sector or fund sector.

2. The best quote on a CDS may come from the least suitable counterparties. In other words, it may come from those CDS counterparties that are likely to have existing exposures to the reference entity and therefore may present increased correlation risk. This means that the CDS seller may have large exposure to the reference entity. If the reference entity defaults it could cause problems for the CDS seller and, in turn, leave the buyer with zero protection. In this situation, there are now two defaults, rather than just the original one with the reference entity whose credit risk was being hedged.

If the credit quality of the protection seller (the CDS seller) declines after an organization has bought a CDS from it, and there has not yet been a credit event affecting the reference entity (so no payout has been made on the CDS), the buyer has the choice of trying to terminate the CDS early (although this could be difficult since early-termination provisions are not normally included in CDS deals under ISDA), or the CDS buyer could buy credit protection against the CDS seller. The decision rests on the creditworthiness of the reference entity and on the correlation between a default by the CDS seller and a default by the reference entity. This could be the case if both reference entity and CDS seller are in a country which has just had its rating downgraded or perhaps is situated close to a potential war or conflict. It is important, especially as a buyer, to check prior to the execution of a CDS that the credit risks of the reference entity are not strongly positively correlated with the seller of the CDS.

For traders and investors who are CDS sellers, the risk is much simpler, as they don't receive the premium due on the CDS. Non-payment of the basis-point premium will normally enable the seller to terminate the contract.

BASIC OVERVIEW OF PRICING AND VALUATION MECHANICS

A common approach is to use the asset swap spread for the reference credit in the maturity of the CDS contract and to adjust it up or down, based on factors such as expected financing rate and liquidity.This can be illustrated by the following example.

Suppose that the benchmark interbank rate is Libor and that the funding rate for a risky bond is also Libor. Consider a transaction where an investor has a long position (has bought the bond) in a risky bond earning Libor +80 basis points (bps) hedged with a CDS. Ignoring counterparty risk, the net effect of this transaction is to mitigate the trader's default-risk exposure to this risky bond. Hence, the default protection should cost the investor 80bps.

If the CDS spread is less than 80bps, in a perfect world the investor could buy the bond, finance it at Libor and buy default protection to earn a small positive return for no risk. Similarly, if the default-swap spread is higher than 80bps, the investor can short the bond, sell default protection and receive a small positive return.

It is fair to say that this basic approach is the favored starting point for pricing and is likely to become more meaningful as liquidity moves from the bond market to the credit derivative market.

WHICH CREDITS CAN BE TRADED?

Although market participants do trade credit-default swaps on non-rated entities, this is not common practice. Furthermore, most market participants insist on a reference obligation, which is normally a fixed-rate bond issued by the reference entity. In the absence of a rating and any relevant bond issuance, potential liquidity for that "name" or company diminishes significantly.

However, some traders are willing to look at almost any credit and decide if they want to make a price on it, so it is worth asking around.

DOCUMENTATION FOR CREDIT DERIVATIVES

The documentation for credit derivatives has become both more sophisticated and more standardized. ISDA has helped to speed up documentation time for new deals and reduce documentation risk.

The majority of credit-default swaps are traded on an ISDA basis. ISDA's drive to assist the credit-derivatives market is also illustrated by the introduction of its Derivatives Market Activity Survey in 2001. ISDA 1999 Credit Derivatives definitions (plus supplements) are used with standard ISDA Master Agreements. These guides are available from ISDA.

THE DEVELOPMENT OF THE CDS MARKET

- **Enron and CDS**

The credit-default swaps market proved its worth in the Enron crisis of 2001 by sounding alarm bells about the energy giant several months before it collapsed. Enron's stock didn't begin its most breathtaking plunge until mid October, when the company's offshore partnerships were uncovered. But two months before that the danger signs began to show up in the credit-derivatives markets.

On 15 August, the day after Enron chief Jeffrey Skilling's abrupt resignation, Enron stock barely budged, closing just above the US$40 mark. But, on the same day, the price of an Enron credit contract jumped 18%. Contracts bought that day were priced at 185 basis points (US$185,000 annually for protection against default on a US$10 million loan). And by 25 October, as the troubles began to make headlines, Enron stock had dropped more than 50%, while the credit contract had soared in price to US$900,000 per US$10 million annually. Even at the much higher price, it was actually a great deal.

Of course, after Enron announced Chapter 11 in early December 2001, U.S. energy companies were severely hit by the credit fall-out in the energy sector. In the week after the Enron collapse, the five-year credit-default swap spreads on El Paso widened to around 325bps from 225bps the week before Enron's demise. Williams Energy was also hit, with its credit spread widening to 295bps from about 180bps in the same week. But rather than halting developments in CDS, the Enron collapse has demonstrated the effectiveness of this new method of credit-risk mitigation and the CDS market in the energy and transportation sector continues to grow at a rapid rate.

A good source of information can be found at *CreditEx*. (www.credittrade.com), which operates one of the most active electronic trading platforms and information systems for credit-derivative swaps.

Although it is impossible to eradicate credit risk completely, it is possible to enhance or upgrade the credit risk an organization is obliged to take. There is a cost to this process, but when balanced against the potential cost of taking the hit of a major default, it may appear cost-effective. This was also seen in the Enron scenario: Enron assigned profitable OTC deals to companies to whom they owed money; some OTC trades were converted via EFS transaction (exchange futures for swaps) on to exchanges (OTC Natural gas positions in U.S. Henry Hub GAS and also U.K. Natural Gas NBP were all transacted in this way over into the clearing house mechanism with margins to keep counterparties happy and reduce OTC exposures).

- **The size of the CDS market**

ISDA began reporting the size of credit-default swaps in 2001: in its end-of-year members' survey findings (in which 80 members participated), it reported the CDS market's outstanding notional value at US$918.9 billion. In mid 2005, ISDA reported that the global credit market had surged to a value of US$12.43 trillion, having grown in volume by more than 12 times in just four years. It had grown so quickly in fact that banking regulators around the world voiced concerns about risk-management practices in the derivatives market. Banks' back offices had been struggling to keep up with the booming market, creating a large number of outstanding unsigned confirmations between counterparties.

TOTAL-RETURN SWAPS

A total-return swap (TRS) is a credit-derivative swap in which one party agrees to pay the other the total return of a defined asset in return for receiving a stream of, typically, Libor-based cash flows. The underlying asset is typically a single stock or stock index, a bond or portfolio of credit instruments. The TRS is merely a mechanism for the user to enjoy the economic benefits of owning an asset without using the balance sheet and can be used to give general protection against country or political risk.

- **TRS vs. CDS**

The difference between a TRS and a CDS is that a CDS simply transfers credit risk and requires a credit-event default to trigger a payout by reference to some designated reference asset (usually a bond or other rated instrument issued by the reference entity). A TRS, however, transfers all the risks of owning the designated asset. The TRS transaction keeps the reference obligation (for example, the bond) on the investment/trading book of the counterparty who was originally holding it. The counterparty buying into the returns on the reference obligation is seeking those returns without buying the asset. This is illustrated in Figure 16.4.

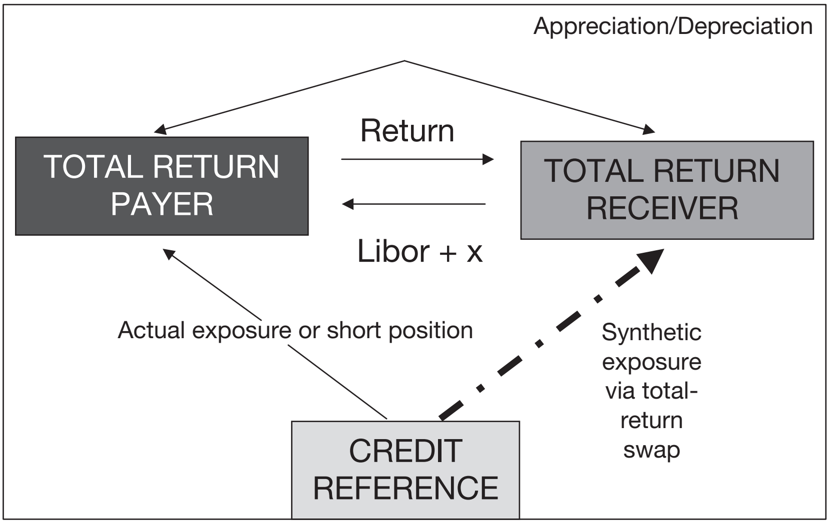


FIGURE 16.4 The relationships in a TRS transaction

- **Country risk application**

A CDS may look very like a TRS, but there are significant differences in the timing and the extent of coverage. Whereas a CDS needs to have its maturity set to be the same as the asset that is being hedged (if full protection is needed), a TRS does not. Whatever the time period, the TRS will cover any economic deterioration during that time, as well as paying out an economic benefit or appreciation. The buyer undertakes to pay the seller for each defined period the amount of any interest received on the asset, plus capital appreciation. In return, the seller commits to pay a floating interest rate plus any capital depreciation.

In the energy industry, an organization may decide to use a TRS when it is concerned about political unrest in a particular country and wishes to reduce its exposure to that country while still being able to trade with local counterparties. (In credit-limit policies it is quite normal to have counterparty-by-counterparty limits and then overall country-risk credit limits.)

An example of this could be the exporter of oil or LNG/LPG cargoes to an emerging market who wants to protect against sovereign or political risk during a period of uncertainty. In this case, the TRS credit derivative could have as a reference asset a sovereign bond issued by that country. The great advantage the TRS has over the CDS is that it will generate positive returns for the buyer if the credit quality of the emerging market in question merely deteriorates. It does not actually need to default, unlike in the case of a CDS.

OBSTACLES AND LIMITATIONS TO TRS

The main problem holding back the growth in usage of total-return swaps has been the difficulty of calculating the appreciation or depreciation of the reference obligation (for example, the sovereign bond in the earlier example).

In the absence of an actual market transaction or a default, a very illiquid bond/asset will present significant price-discovery problems, and whilst there are a number of structuring solutions to this, the majority of credits do not have enough liquidity to enable TRS usage.

Another impediment is the lack of a standard structure in the market. Whereas the CDS is now considered a standard product with similar documentation used by all (for example, ISDA-based agreements), the TRS is a long way from achieving this status.

Credit swaps terminology

- **Buyer**
The buyer of protection, or fixed-rate payer, refers to the party that is laying off credit risk by way of a credit derivative.

- **Cash settlement**
Following a credit event, a credit-default swap terminates and if cash settlement is the form of settlement chosen, then a payment is due from the seller to the buyer.

- **Credit event**
A credit event is the event that triggers the termination and settlement of a CDS. The standard events used are bankruptcy, failure to pay and restructuring. With the exception of bankruptcy, these events all apply to the reference obligation(s).

- **Credit line**
An internal limit imposed on the amount of credit exposure that can be extended to a single corporate or sovereign borrower.

- **Deliverable obligation**
An asset or assets, as defined in the confirmation, that can be delivered as part of a contract using physical delivery as a form of settlement.

- **Economic capital**
The amount of capital that a portfolio model calculates is necessary to support the economic risk of a bank's risky assets. The computation of economic capital is currently not a regulatory requirement.

- **Failure to pay**
The failure by a reference credit, after the expiry of any applicable grace period, to make payments due under a reference credit.

- **Physical delivery**
Following a credit event, a CDS terminates. If physical delivery is the form of settlement chosen, on the settlement date the buyer delivers to the seller a notional amount of the deliverable obligation equal to the notional of the contract in exchange for receipt of the notional of the contract from the seller.

- **Reference credit**
The reference credit is the legal entity that is being hedged by way of a credit derivative.

- **Reference obligation**
The reference obligation is an identified asset or assets, normally issued by the reference credit, that may be used to identify whether there has been a credit event and may be used to determine cash settlement following a credit event.

- **Regulatory capital**
The amount of capital required of a bank to hold in support of its risky assets. The current rules (part of the 1988 Basle Capital Accord) generally require US$8 of capital for every US$100 of corporate exposure, US$1.6 of capital for every US$100 of OECD bank exposure, and US$0 for any OECD sovereign exposure.

- **Restructuring**

This term refers to changes to a reference obligation that have a material impact on its economics. These are defined at length in the ISDA Credit Derivatives Definitions but are revised in the "Modified Restructuring" language also available from ISDA. The market uses two definitions: "Mod R" and "Old R".

- **Seller**

The seller of protection, or floating-rate payers, refers to the party that is taking on credit risk by way of a credit derivative.

MITIGATING CREDIT RISK VIA CLEARING HOUSES

The ultimate credit-risk tool is a well-capitalized central clearing house. Centralized clearing provides multilateral netting, standard margining, and a highly rated guarantor in case of a default. This is not cheap, and is probably the most expensive route to guarantee an OTC derivative transaction.

The process by which a clearing house becomes a central counterparty to an OTC deal is as follows.

Two OTC market counterparties, A and B, negotiate and agree a deal with one another. This takes place in the normal manner, either over the phone or via an electronic trading platform. Once the deal has been concluded on the basis of becoming a "cleared" deal, it is automatically "novated" up to the clearing house. This takes place under some master clearing agreement with the clearing house which allows the clearing house to take over as counterparty to the deal.

From this moment onwards the clearing house is the legal counterparty to A + B; that is, it replaces A as B's counterparty, and replaces B as A's counterparty to the OTC derivative deal. The OTC derivative is then subject to the terms and conditions and the rule book of the clearing house. ISDA terms no longer prevail.

The clearing house will charge a fee on every contract cleared and financially guaranteed. As is the case with futures contracts, it will normally charge a good-faith deposit (called the "initial margin") on the opening of the OTC derivative. This needs to be maintained for the duration of the OTC contract being kept at the clearing house.

On a daily basis, the clearing house will perform marked-to-market calculations to determine the most reasonable fair value of a client's positions. Any unrealized loss that is calculated on the open position of the OTC contracts with the clearing house will have to be financed. This is generally referred to as "variation margin".

The cost of clearing trades via a clearing house is primarily made up of the cost of financing the margins placed at the clearing house against OTC derivatives positions and the fees charged per contract for clearing the trade. In addition, collateral placed with clearing brokers or with the clearing house directly against OTC positions may create other business costs. This working capital may not then be available to take advantage of business/trading opportunities, so there is an opportunity cost which may be difficult to calculate.

Summary of OTC clearing house initiatives

- **Intercontinental Exchange electronic trading platform (ICE) and London Clearing House (www.theice.com) (began in 2002)**

Clears ICE-executed swaps and option deals in oil, power and natural gas OTC derivatives in the U.S., Europe and Singapore oil markets,

Deals are executed via the ICE electronic-trading platform as cleared deals and automatically flow into the London Clearing House (LCH) system. Users must have the tri-partite OTC clearing agreement signed between them, their nominated clearing broker (an LCH member) and the LCH. They must also be members of ICE. Once they have their ICE terminal log-in and password, they can nominate which clearing broker they want to clear their trades. Their nominated clearing broker will set up account details on its Clearing Administration ICE screen. When this is done, trades executed as "cleared" trades will automatically flow into their clearing account at their broker. If a company already has a futures account with an LCH clearing member, only the tri-partite documentation will usually need to be signed. OTC cleared trades will be booked into their existing futures account.

- **Nord Pool began in 1996 through deregulation of power markets in Nordic countries (www.nordpool.no)**

Through the Nordic Electricity Clearing House (NECH) clearing service, clearing members are offered clearing of contracts traded over the Nordic Power Exchange and financial contracts traded in the bilateral market. NECH acts as middleman in contracts and as the clearing member's counterparty. In doing this, sellers and buyers have only one legal counterparty, and NECH guarantees financial settlements.

NECH offers complete solutions for clearing current products traded on and outside the Nordic Power Exchange. For financial electricity contracts, this means that standard contracts are evaluated together and the clearing member is given one net position in each contract series. This net position is the foundation for calculating the daily margin call and settlement.

Clearing of physical electricity contracts applies to contracts traded in Elspot and Elbas. Nord Pool Spot AS is the contractual counterparty for contracts traded on the physical-delivery market. However, NECH administers all clearing services.

For NECH to take on counterparty responsibility, each clearing member wishing to trade and clear its electricity contracts must provide collateral covering the daily margin call, which comes in addition to an initial margin call.

- **European Energy Exchange (EEX) (www.eex.de)**

This clearing house clears and guarantees spot and future transactions in German power. These contracts go to delivery. It is possible to post OTC power trades onto the exchange for a reduced clearing fee from that of EEX futures contracts.

- **New York Mercantile Exchange (NYMEX) (www.nymex.com) — CLEARPORT CLEARING — launched in 2002 and operating the largest range of OTC energy derivatives available for clearing as of June 2007.**

This clearing house clears a wide range of OTC crude oil, oil products, gas, power and U.S. coal-related OTC derivatives trades via its online system.

Hundreds of OTC-cleared derivatives contracts are available for credit clearing on the Clearport Clearing platform.

MANAGEMENT GUIDELINES ON ESTABLISHING A CREDIT-CONTROL FRAMEWORK

- **Establishing a credit-risk environment**

The board of directors should have responsibility for approving and periodically reviewing the organization's credit-risk strategy and policies.

Senior management should have responsibility for implementing the board-approved strategy and for developing policies and procedures for identifying, measuring, monitoring and controlling credit risk. Such policies and procedures should address credit risk in all of the company's activities and at both the individual credit and portfolio levels.

Organizations should identify and manage credit risk inherent in all their products and activities. They should ensure that the risks of all products and activities are subject to adequate procedures and controls before being introduced or undertaken, and that they are approved in advance by the board of directors or its appropriate internal committee.

- **Operating under a sound credit process**

Organizations should establish overall credit limits at the level of individual counterparties and groups of connected counterparties. There should be a clearly established process in place for approving new credit lines and counterparties (even if they are going to place collateral with an organization prior to trading) as well as the extension of existing credits. It is just as important for organizations to know their counterparties really well to protect against fraud and money-laundering as it is to assess counterparties as worthy credit risks.

Organizations should have management-information systems and credit-analysis techniques that can enable senior management to measure the credit risk in all on- and off-balance-sheet activities. The management-information system should also provide information on any concentrations of credit risk in particular entities or groups of companies and even country-risk concentrations that may require attention.

- **Ongoing controls over credit risk**

Organizations should look to establish independent, ongoing credit-review procedures; the results of such reviews should be communicated directly to the board of directors and senior management.

It is important to establish and enforce internal controls and other practices to ensure that any exceptions to credit policies, procedures and credit limits are reported quickly to those who exercise a control function in the company. Any organization should have internally approved contingency plans/procedures in place for managing problem credit risks.

Energy Markets: Price Risk Management and Trading
By Tom James

CHAPTER 17

Accounting for Energy Derivatives Trades

INTRODUCTION

In the past, derivatives accounting was, at best, a quagmire of non-standards, inconsistent guidelines and general confusion; and developments in the derivatives market seemed, until recently, to consistently outpace the development of financial regulations and accounting standards to control and account for them. This lack of clear accounting standards meant that users of derivatives had to interpret Generally Accepted Accounting Practices (GAAP) to cover derivatives as best they could and sometimes, in doing so, opened themselves up to criticism. The area that caused particular difficulties was how to account for hedges (derivatives used to control the price risk in such things as commodity inventory/stock, oil cargoes, and the forward cost of production/consumption).

However, two accounting standards emerged in 2001 that finally began to clarify matters: the FAS 133 (from the U.S.-based FASB) and the IAS 39 (from the London-based International Accounting Standards Committee). It is these two standards that are the focus of this chapter.

Although they were developed separately, the two sets of standards adopt a similar overall approach to derivatives reporting and accounting. The choice of standard will depend upon the jurisdiction under which an organization falls or it may be the decision of the board of directors, as advised by its accountants or auditors. From a practical standpoint of implementation and associated ongoing maintenance, my preference for companies/end-users hedging with derivatives is IAS 39.

Since 2005 European-listed companies have had to prepare accounts in line with the IASC standards. Both FAS 133 and IAS 39 standards require derivatives to be marked-to-marked (the process of obtaining a fair valuation on a regular basis for derivative markets) and reported on the balance sheet.

Of course, some risk managers and accounting staff are concerned about the implications of these new accounting standards. Since accounting regulations sometimes do not allow assets and liabilities to be marked-to-market, volatility in the organization's income statement could be increased as a result of having to add the derivatives hedge P&L in certain circumstances.

In the past, the majority of users of derivatives (even end-users such as airlines and utilities) marked-to-market their derivatives positions, which entailed taking the executed price of the buy/sell position and comparing that to the current day's value for the same contract. Through this process, companies could keep informed of unrealized profit or loss on their derivatives book (positions). With the new standards, the difference is that they have to report these figures on their balance sheet.

For example, if company ABC buys an OTC jet-fuel swap and pays a fixed price of US$40 for 100,000 barrels a month over 12 months (that is, 1.2 million barrels), the notional value (NV) of this trade is US$48 million, calculated as follows:

(100,000 x 12) x US$40 = US$48 million.

So the traded price is the fixed price of US$48 per barrel and the marked-to-market value is the difference between the trade price and the current, or last-known, market price. If the price goes down to US$38, the derivative position's MTM value is now –US$2.4 million, calculated as follows:

(100,000 x 12) x – US$2 = – US$2.4million

Before FAS 133 or IAS 39, companies would not have had to report this US$2.4 million unrealized loss anywhere in their balance sheet. The derivative and, in turn, its unrealized loss would stay "off-balance-sheet" until its expiry and settlement or when the position was closed out by a trader. At this stage, the amount paid out or received by the company on the derivative position would have been subtracted or added to the company's earnings statement. This is no longer the case, as the new accounting regulations require companies using derivatives to report their portfolio's marked-to-market value. This means that companies have to report the unrealized loss or profit from derivatives on their balance sheet rather than just the final cash figure that is paid out or received at settlement of the transaction. If a company were hedging against some physical energy risk and having to report its derivatives hedge P&L in its balance sheet, this could create counter-productive volatility in the company's statements. For this reason, FAS 133 and IAS 39 go into great detail on special "Hedge Accounting" methods to handle the reporting of derivatives if they are used as a hedging tool against some physical energy transaction. However, if the company is just investing in the market and trading derivatives for speculation and profitable gain, the unrealized P&L of its derivatives portfolio needs to go straight to the balance sheet, whatever accounting standard the company chooses to follow.

Hedge accounting under these new accounting rules is certainly much clearer and in this chapter we take a look at how to interpret the new accounting standards from a derivative user's and management viewpoint, focusing on the key accounting scenarios that the majority of companies may face. Of course, all companies already involved in, or looking to embark on, the use of derivatives for trading or hedging purposes should get expert advice from accountants or auditors for their specific derivatives usage. Because of the greater complexity of hedge account regulations, such advice is particularly crucial for organizations which are hedging for risk-management purposes.

CONSOLIDATION AND CLARIFICATION OF ACCOUNTING STANDARDS 2002–06

The main work on the consolidation and clarification of standards has been done by the Financial Accounting Standards Board (FASB) in the United States and the International Accounting Standards Committee (IASC) in the United Kingdom. Both of these organizations have made clear progress in creating standards for participants in the derivatives market and both accounting standards provide useful guidelines for management to work from.

The FASB (see www.fasb.org) introduced FAS 133, "Accounting for Derivative Instruments and Hedging Activities", with effect from the beginning of 2001. The IASB (see www.iasb.org), has become the international standard setter on derivatives and hedge accounting through its international accounting standard number 39 (IAS 39).

Before FAS 133 and IAS 39 were introduced, the GAAP only created enhanced footnote disclosures (notes of reference, explanation, or comment usually placed below the main accounting report entries). They did not focus on the actual issue of accounting for derivatives and, as a consequence, many derivatives contracts remained off the balance sheet.

Under the new accounting rules for derivatives, users of derivative instruments (contracts) not only have to report accounting entries for derivatives but also have to be able to answer key questions about the instruments they have chosen for their hedging practices and how they determine that these instruments are effective hedges.

These have been the two biggest issues for corporations to administer since most banks and financial institutions have always written detailed internal papers on their derivatives usage in compliance with existing regulations and guidelines. The upside for the industry as a whole is that it forces all participants at all levels to take a serious look at the derivatives they are using and their reasons for using them.

Of key concern from a risk-management perspective is how to conduct proper accounting for hedges (derivative transactions entered into for the purposes of reducing price-risk exposure). In the past, this has been a grey area because of a lack of standardization. Before FAS 133 and IAS 39, GAAP had different accounting methods for different types of hedge, depending on the types of underlying energy risk. Hedge accounting is a key issue because anyone hedging using derivatives will wish to show in their financial statements that they are reducing or eradicating certain price-risk exposures. However, the risk attendant on speculating with derivatives that could result in a big gain or a big loss needs to be properly reported so that management and investors can monitor and control it properly.

FAS 133

Under FAS 133, which came into effect in the United States on 1 January 2001, all derivatives instruments appear on the balance sheet at what is termed “fair value”; that is, at a market price that is impartial to both buyer and seller. Such a price is often determined by reference to a pricing model.

This standard focuses on “hedge” accounting for risk-management purposes and introduces rules to determine whether a derivative qualifies for hedge accounting and which instruments do not qualify or cannot be used to hedge a position. Since companies now have to prove the effectiveness of their hedges, the choice of derivatives is critical.

The use of derivatives falls under one of the following categories:

- *For speculative purposes*: In this case, gains and losses must be marked-to- market and will be recognized in the "current earnings" of the financial statement.

- *To hedge the exposure associated with the price fluctuations of an asset, liability, or firm commitment*: The carrying value of the item being hedged is adjusted to reflect the change in its market value as a result of the risk being hedged, and this change is posted to earnings. Corresponding profits or losses on the derivatives used to hedge the risk are also posted to earnings, just as they are for non-hedge derivatives applications.

- To *hedge the exposure associated with an uncertain forecast cash flow*: For cash-flow hedges, derivatives results must be evaluated and a determination made as to how much of the result is "effective" and how much is "ineffective". The ineffective component of the hedge result must be realized and posted in current income. The FASB recognizes hedges as ineffective for accounting purposes only when the hedge effects exceed the effects of the underlying forecast cash flow (on a cumulative basis).

The "fair value" accounting method is used for fair-value hedges, which are derivatives used to hedge an underlying energy production or consumption. The accounting treatment of the hedge (the derivatives position) follows the accounting treatment of the asset (the energy production or consumption). Both are marked-to-market and the cash flows from both the derivatives hedge and the physical energy exposure are recognized in current earnings and recorded in earnings.

The accounting for the derivative hedge is the same as that for speculative derivative positions except that, because of the risk of the physical energy being hedged, the hedged physical energy exposure must also be marked-to-market. Once this is done the results of the derivatives hedge and the physical energy exposure is reported to the "current income" statement.

This is where the choice of derivatives contract for hedging purposes is very important. If the hedge is not a perfect hedge (that is, the price movements in the derivative contract do not reflect exactly the movement in the underlying energy exposure that is being hedged), there could be an impact on earnings.

For cash-flow hedges, any profits or losses on the derivatives hedge need to be evaluated and the organization hedging needs to establish by how much it is ineffective. Any ineffective amount must be realized immediately in "current income", while the effective portions of the hedge are initially put in a newly established income-statement category, OCI. OCI (Other Comprehensive Income) has been specifically created for derivative-hedge accounting purposes. Profits/losses from derivative hedges are put into the OCI category until it is time to recognize them in "current income" at the end of the whole transaction (the hedge and the underlying energy exposure).

For example, if a derivatives hedge is making a profit of US$1 million but the physical energy position is losing US$750,000, then there is US$250,000 that has to be reported straight onto the current income/earnings statements. The other US$750,000 would be posted to the OCI until the overall trade has been completed.

One new burden for corporate users of derivatives for hedging is that they have to show that the derivative instruments they are using for hedging show a close correlation with the underlying physical energy being hedged.

The FASB actually demands an "effectiveness test" which has to be performed before the execution of the hedge and then on an ongoing basis every quarter. If the hedge proves to be effective, then the contracts used for the hedge qualifies for hedge accounting.

In energy markets we often see unstable price-correlation patterns caused by seasonal effects or political problems/issues in the Middle East. It is important to remember that under FASB rules it is necessary to prove that the price reference of a derivatives hedge is closely correlated with the underlying being hedged. Effectiveness testing using statistical methods such as regression analysis does not guarantee that the correlation will remain strong and effective in the future, which is why FASB requires firms to check at least every three months on the continued effectiveness of the hedge. To make things easier, FASB has not endorsed any particular methodology. Any user of derivatives will want to have effective hedges because, as shown earlier, any ineffectiveness is reflected immediately in income/earnings statements and can cause additional volatility in a company's overall balance sheet.

As a measure of effectiveness, the FASB chose to apply the 80/20 offset ratio as standard. If the correlation does not show the required effectiveness, the hedge must be terminated and the profits/losses posted to the earnings of the company, leaving the user looking for another derivatives market from which to obtain a better hedge.

All of this could entail too much administration work for a small trader or corporate end-user of derivatives and there are also headaches in the industry over effectiveness testing. If regression analysis is used to work out whether a hedge will prove to be effective for hedge accounting to apply, an organization then has to decide whether it uses data on price levels or price changes and whether to utilize daily, monthly or quarterly data intervals.

Another concern over the implementation of FAS 133 is that it could increase volatility of reported earnings in a company's income statements. Some in the derivatives industry may argue that changes in the marked-to-market value (fair value) do not provide any revenue to an entity and therefore should not be included in a user's income statement. The other side of the argument, though, is that FAS 133 now creates reporting for volatility that always existed but which was never reported before under previous accounting standards.

From a practitioner's standpoint, the IAS standards discussed below may be more straightforward for end-users and corporates to adopt, given the grey areas in the FAS 133 regulations. However, other international standards such as the IAS 39 are trying to eliminate the differences with U.S. GAAP standards.

INTERNATIONAL ACCOUNTING STANDARDS BOARD (IASB) (www.iasb.org)

- **IAS 32 — financial instruments disclosure and presentation**

Before looking at the IAS 39 accounting standards for derivatives, it is necessary first to clarify what a derivative contract is for the purposes of IAS 39. In the IAS 32 guidelines, it defines a financial instrument as "any contract that gives rise to both a financial asset of one entity and a financial liability or equity instrument of another entity". It goes on to define financial instruments as including "derivative instruments such as financial options, futures and forwards… swaps". Derivative financial instruments (for example, swaps and options) meet IAS 32's definition and are subject to this accounting standard.

Under the definition, "derivative financial instruments" should create rights and obligations that have the effect of transferring between the parties to the contract one or more of the financial risks inherent in an underlying primary financial instrument. In energy markets, the main underlying financial risk is the market price. Derivative financial instruments do not generally result in a transfer of the underlying primary financial instrument on inception (just as with an oil price swap under a ISDA Master Agreement, which is cash-settled, there is no exchange of the physical oil, nor is the full notional value of the contract ever transferred), and such a transfer does not necessarily take place on settlement or closing out of the contract.

IAS 32 says that if a trader buys or sells a non-financial item (for example, a commodity futures contract) that has physical delivery of the commodity as its final settlement on expiry, for a fixed price and at a future date, this will not meet the definition of a "financial instrument". In the context of energy-futures markets, this means that a firm's derivatives futures position does not fall under IAS 32 reporting requirements if it is using a derivative instrument that can go to physical delivery on final settlement.

So it is worth noting what contracts can be excluded under these derivative accounting regulations. Some of the key futures contracts that can be excluded under the IAS 32 regulations for reporting derivatives are listed below:

- NYMEX WTI Crude Futures (Heating oil NYMEX Futures; Unleaded Gasoline; Henry Hub Gas; Electricity)
- ICE Gasoil
- ICE Nat Gas NBP
- Dubai Mercantile Exchange — Oman Crude Futures

The ICE Brent contract, however, is included since it is a cash-settled futures contract and no physical delivery can take place via the futures expiry/settlement. An organization's positions would also fall under IAS 32 reporting guidelines if it regularly settles its futures contracts by trading out of them with an offsetting buy/sell futures position and/or usually takes delivery of the physical commodity and sells out of it within a short period after delivery in order to generate a profit from short-term price movements. This would indicate the futures contract is entered into for speculative/trading purposes and not for its own physical purchase, sale or usage requirements.

Under IAS 32, all ISDA-based swaps specify settlement through cash payments, determined according to a formula specified in the contract. The swap is indexed to a commodity price but is settled only in cash. Therefore, ISDA-based swaps on energy prices constitute a financial instrument and must be disclosed.

IAS 39 FINANCIAL INSTRUMENTS: RECOGNITION & MEASUREMENT

IAS 39 became effective for financial years beginning on or after 1 January 2001 and all listed companies in Europe were required to produce accounts in accordance with IAS 39 from 2005 onwards (IAS 39 is a supplement to the disclosure requirements of IAS 32 for financial instruments).

Under IAS 39, all financial assets and financial liabilities are recognized on the balance sheet, including all derivatives. They are initially measured at cost, which is the fair value. After the initial recognition on the balance sheet, all derivatives are re-valued on a fair-value (marked-to-market) basis.

It is quite similar in many respects to FAS 133 and organizations looking to implement IAS 39 can learn from their American cousins as to the issues at hand. In fact, the IASB continues to work on the convergence of IAS 39 standards with FAS 133 each year.

IMPLEMENTING IAS 39

As IAS 39 contains some of the most complicated rules introduced so far, it is important that companies familiarize themselves with its requirements and keep these in mind when implementing a formal risk-management policy. An organization will need to provide a great deal of detail on its hedging activities in order to be able to book derivatives as hedge transactions. Many users of derivatives may find that for the first time they need to implement an automated accounting/risk-management system in order to deliver the necessary IAS 39 documentation for accounts on, for example, marked-to-market valuation of derivatives positions. They will also have to produce documentation on the derivative positions, provide "effectiveness testing" of their hedges to determine whether they qualify for hedge accounting.

- **What is a hedge item under IAS 39?**

A hedged item can be an asset or liability, a firm commitment, or a highly probable forecast future transaction that exposes the company to a risk of changes in fair value or future cash flows. For example, a buyer of LPG cargoes which bottles the LPG for retail re-sale may normally just buy its LPG on a spot basis and have no contractual commitments to take regular cargoes from anyone. This organization may, however, have a highly probable forecast future purchase of LPG to resell on to a retail network and unless it uses derivatives to hedge its price risk it could face competitive risk against other suppliers, not to mention profit exposure.

Under this standard, a hedge qualifies for hedge accounting:

- If it relates to a specific and identified risk, and not merely to an overall business risk, and it must ultimately affect the organization's profit or loss
- If it is expected to be highly effective in achieving offsetting changes in fair value or cash flows (if the derivatives contract moves in line with the underlying asset or the cash flow it is trying to protect)
- If an organization at the beginning of the hedge has put together internal documentation of the risk-management objective and the strategy for the hedge. (This documentation must include identification of the hedging instrument; details of the energy exposure being hedged; the nature of the risk being hedged; how the organization is going to assess the derivatives' effectiveness for hedging the changes in the hedged item's fair value or the hedged transaction's cash flows that are attributable to the hedged risk; and the effectiveness of hedging should be assessed at a minimum when the organization prepares its annual or interim financial statements.)

• What is considered a highly effective hedge under IAS 39?

A hedge is regarded as highly effective if, throughout the life of the hedge, the organization should expect changes in the fair value or cash flows of the hedged item to be almost fully offset by the changes in the fair value or cash flows of the derivatives instrument creating the hedge. Like FAS 133, this standard does not specify a single method for assessing hedge effectiveness, but says that an organization's documentation about the hedge should include its procedures for assessing effectiveness. This should be evaluated at a minimum at the time the user prepares its annual or interim financial statements. If the key terms of the derivatives instruments and the hedged asset or liability or hedged forecast transaction are the same, an organization can conclude that changes in fair value or cash flows of the price risk being hedged are expected to offset each other fully at execution of the hedge and on an ongoing basis.

For example, an organization may assume that in the case of a derivatives hedge on a forecast purchase of some physical oil, gas or power with a futures or swap which has the same pricing reference as the underlying oil, gas or power being hedged, that the hedge will be highly effective and that there will be no ineffectiveness in profit or loss protection.

This is the benefit of OTC derivatives, as more often than not it is possible to obtain a swap or options contract that is priced against the same reference price as the physical energy being hedged. Then there is only the timing basis risk, where the timing of the derivatives contract does not match the underlying physical energy being hedged.

Although IASB does not specify a single method for assessing a hedge's effectiveness, its IAS 39 documentation does give an example to work from. If the organization using the derivatives for hedging can expect changes in the fair value/cash flows of the hedged item to be almost fully offset (protected) by the changes in the fair value/cash flows of the derivatives hedge, and if actual results of effectiveness assessments are within a range of 80% to 125%, it can conclude that the hedge is highly effective. For example, if the loss on the hedging instrument is US$120 and the gain on the energy price being hedged is US$100, the offset/level of protection/correlation can be measured by dividing one by the other, as follows:

120/100 = 120% or 100/120 = 83%.

Both results are within the 80% to 125% range, so this could be covered as an effective hedge.

If a fair-value hedge meets these conditions, it would be accounted for under IAS 39 in the following way:

- The gain or loss from marked-to-market revaluation of the hedging instrument at fair value (for a derivative hedging contract) should be recognized immediately in profit or loss.
- The profit or loss on the hedged item (the underlying energy exposure) attributable to the hedged risk should adjust the carrying amount of the hedged item and be recognized immediately in profit or loss (the underlying energy exposure).

Since the value of derivatives hedges and the hedged item are both reported to profit and loss it is important that users choose wisely the type of derivatives for hedging. Ineffective hedges will certainly add volatility to a user's balance sheet.

- **What is evidence of fair value for marked-to-market purposes?**

Currently, IAS 39 states that a "quoted price" on an exchange or from several counterparties in the marketplace is normally the best evidence of fair market value. It has been proposed, though, that this wording be amended in the future to "quoted market price IS the best evidence of fair value". IAS 39 is generally similar to that under GAAP and the IASB continues to propose amendments that will reduce further or eliminate altogether any differences.

STEPS TO ESTABLISHING HEDGE ACCOUNTING

- **Formulate policy**

Will the firm adopt hedge accounting for derivatives? BHP Billiton, one of the world's largest natural resources firms, decided not to adopt hedge accounting but, instead, to educate its investors about the additional volatility in its balance sheet that might be witnessed as a result of not offsetting derivative hedge cash-flows with physical commodity positions.

- **Identify exposure**

You will need to identify your commodity exposures and to check that the relevant derivatives markets actually fit the effectiveness requirements in correlating with the physical commodities to which your firm has exposure.

- **Design strategy**

Formal documentation is required at the inception of the hedge and must include the identification of the hedging instrument (often a derivative) and the item being hedged; the nature of risk being hedged; the risk-management objective/strategy; and how the effectiveness of the hedge will be monitored. "Effectiveness" here means the ability to generate offsetting changes in fair value or cash flows.

Accounting methods and approaches to derivatives can be very daunting for anyone without an accounting background. Some of the key aspects to watch out for are summarized below.

For gauging the effectiveness of the derivatives hedge, ongoing monitoring is required. Hedge accounting is built around an initial expectation of there being a highly effective hedging relationship between the chosen derivatives market and the physical, underlying, commodity being hedged. Not only do you need to know the history of that relationship, you must also monitor its current status on an ongoing basis. At each balance sheet date (usually every three months), you will be expected to check that your hedge is still effective.

To be effective, the price of your derivative hedge should correlate with an 80–125% offset against the physical energy market being hedged. Otherwise, it's not effective and hedge accounting methods cannot be used in the balance sheet. In such cases, you will need to talk to your accountant about how this will affect your business.

Once you have established your approach to hedging and the derivatives that can fit the effectiveness required, the firm then needs to decide on the approach to accounting.

The two most common types of hedge accounting methods — cash-flow hedge accounting and fair-value hedge accounting — are outlined below. The standards are always changing and it is advisable to seek professional accounting advice when setting up your hedging approach.

- **Cash-flow hedge accounting**

This is the most common hedge used in the commodities industry for hedging the exposure to price movements in future cash flows (that is, in forecast transactions).

The accounting records the fair value of the contract on the balance sheet and through equity, with ineffectiveness recorded in earnings. Only the change in the hedging instrument is adjusted; there is no accounting of the hedged item. Amounts recorded in equity are moved into the income statement when the hedged item records a profit or loss.

- **Fair-value hedge accounting**

This hedges the exposure to changes in fair value of a recorded asset/liability or unrecorded firm commitment (fixed-rate debt, inventory, and so on). The accounting records the fair value of the hedged item and the hedging instrument on the balance sheet, with the offset booked to the income statement. Both the hedged item and the hedging instrument are adjusted for changes in their fair value caused by changes in the underlying hedged risk.

CLOSING NOTE

Now more than ever before, companies that hold assets (an oil well or a power station, perhaps) are encouraged and required to use mark-to-market (MTM) accounting principles. These new accounting regulations that demand fair-value assessment (marked-to market valuations) of derivative positions and assets (if hedged) are great in theory but can be abused in practice. Some derivative contracts or assets in the energy business do not have unambiguous market prices, and sometimes a great deal of judgment is required when producing a suitable price for MTM fair-value reporting purposes. Financial auditors are supposed to make sure that these mark-to-market valuations are credible and at least reasonable. In the collapse of Enron and the subsequent downfall of its auditors, it would appear this auditing and control function was clearly defective.

Many banks and trading firms for accounting purposes use publishers of independent forward-curve pricing information. Banks falling under Basle II and other regulations must utilize independent information for checking the risk management of the marked-to-market values of their OTC portfolios.

Forward-curve data providers include:
Forward Market Curve: www.forwardmarketcurve.com (energy markets)
Platts Forward Curve: www.platts.com (energy markets)
Imarex: www.imarex.com (freight markets)

Energy Markets: Price Risk Management and Trading
By Tom James

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