

# CHAPTER 2



# Mechanics of Futures Markets

In Chapter 1 we explained that both futures and forward contracts are agreements to buy or sell an asset at a future time for a certain price. Futures contracts are traded on an organized exchange, and the contract terms are standardized by that exchange. By contrast, forward contracts are private agreements between two financial institutions or between a financial institution and one of its clients.

This chapter covers the details of how futures markets work. We examine issues such as the specification of contracts, the operation of margin accounts, the organization of exchanges, the regulation of markets, the way in which quotes are made, and the treatment of futures transactions for accounting and tax purposes. We compare futures contracts with forward contracts and explain the difference between the payoffs realized from them.

## 2.1 BACKGROUND

As we saw in Chapter 1, futures contracts are now traded actively all over the world. The Chicago Board of Trade, the Chicago Mercantile Exchange, and the New York Mercantile Exchange have merged to form the CME Group ([www.cmegroup.com](http://www.cmegroup.com)). Other large exchanges include NYSE Euronext ([www.euronext.com](http://www.euronext.com)), Eurex ([www.eurexchange.com](http://www.eurexchange.com)), BM&F BOVESPA ([www.bmfbovespa.com.br](http://www.bmfbovespa.com.br)), and the Tokyo International Financial Futures Exchange ([www.tfx.co.jp](http://www.tfx.co.jp)). A table at the end of this book provides a more complete list of exchanges.

We examine how a futures contract comes into existence by considering the corn futures contract traded by the CME Group. On March 5 a trader in New York might call a broker with instructions to buy 5,000 bushels of corn for delivery in July of the same year. The broker would immediately issue instructions to a trader to buy (i.e., take a long position in) one July corn contract. (Each corn contract on CBOT is for the delivery of exactly 5,000 bushels.) At about the same time, another trader in Kansas might instruct a broker to sell 5,000 bushels of corn for July delivery. This broker would then issue instructions to sell (i.e., take a short position in) one corn contract. A price would be determined and the deal would be done. Under the traditional open outcry system, floor traders representing each party would physically meet to determine the price. With electronic trading, a computer would match the traders.

**Business Snapshot 2.1** The Unanticipated Delivery of a Futures Contract

This story (which may well be apocryphal) was told to the author of this book by a senior executive of a financial institution. It concerns a new employee of the financial institution who had not previously worked in the financial sector. One of the clients of the financial institution regularly entered into a long futures contract on live cattle for hedging purposes and issued instructions to close out the position on the last day of trading. (Live cattle futures contracts are traded by the CME Group and each contract is on 40,000 pounds of cattle.) The new employee was given responsibility for handling the account.

When the time came to close out a contract the employee noted that the client was long one contract and instructed a trader at the exchange to buy (not sell) one contract. The result of this mistake was that the financial institution ended up with a long position in two live cattle futures contracts. By the time the mistake was spotted trading in the contract had ceased.

The financial institution (not the client) was responsible for the mistake. As a result, it started to look into the details of the delivery arrangements for live cattle futures contracts—something it had never done before. Under the terms of the contract, cattle could be delivered by the party with the short position to a number of different locations in the United States during the delivery month. Because it was long, the financial institution could do nothing but wait for a party with a short position to issue a *notice of intention to deliver* to the exchange and for the exchange to assign that notice to the financial institution.

It eventually received a notice from the exchange and found that it would receive live cattle at a location 2,000 miles away the following Tuesday. The new employee was sent to the location to handle things. It turned out that the location had a cattle auction every Tuesday. The party with the short position that was making delivery bought cattle at the auction and then immediately delivered them. Unfortunately the cattle could not be resold until the next cattle auction the following Tuesday. The employee was therefore faced with the problem of making arrangements for the cattle to be housed and fed for a week. This was a great start to a first job in the financial sector!

The trader in New York who agreed to buy has a *long futures position* in one contract; the trader in Kansas who agreed to sell has a *short futures position* in one contract. The price agreed to is the current *futures price* for July corn, say 300 cents per bushel. This price, like any other price, is determined by the laws of supply and demand. If, at a particular time, more traders wish to sell rather than buy July corn, the price will go down. New buyers then enter the market so that a balance between buyers and sellers is maintained. If more traders wish to buy rather than sell July corn, the price goes up. New sellers then enter the market and a balance between buyers and sellers is maintained.

## Closing Out Positions

The vast majority of futures contracts do not lead to delivery. The reason is that most traders choose to close out their positions prior to the delivery period specified in the

contract. Closing out a position means entering into the opposite trade to the original one. For example, the New York investor who bought a July corn futures contract on March 5 can close out the position by selling (i.e., shorting) one July corn futures contract on, say, April 20. The Kansas investor who sold (i.e., shorted) a July contract on March 5 can close out the position by buying one July contract on, say, May 25. In each case, the investor's total gain or loss is determined by the change in the futures price between March 5 and the day when the contract is closed out.

Delivery is so unusual that traders sometimes forget how the delivery process works (see Business Snapshot 2.1). Nevertheless we will spend part of this chapter reviewing the delivery arrangements in futures contracts. This is because it is the possibility of final delivery that ties the futures price to the spot price.<sup>1</sup>

## 2.2 SPECIFICATION OF A FUTURES CONTRACT

When developing a new contract, the exchange must specify in some detail the exact nature of the agreement between the two parties. In particular, it must specify the asset, the contract size (exactly how much of the asset will be delivered under one contract), where delivery will be made, and when delivery will be made.

Sometimes alternatives are specified for the grade of the asset that will be delivered or for the delivery locations. As a general rule, it is the party with the short position (the party that has agreed to sell the asset) that chooses what will happen when alternatives are specified by the exchange. When the party with the short position is ready to deliver, it files a *notice of intention to deliver* with the exchange. This notice indicates selections it has made with respect to the grade of asset that will be delivered and the delivery location.

### The Asset

When the asset is a commodity, there may be quite a variation in the quality of what is available in the marketplace. When the asset is specified, it is therefore important that the exchange stipulate the grade or grades of the commodity that are acceptable. The IntercontinentalExchange (ICE) has specified the asset in its orange juice futures contract as frozen concentrates that are US Grade A with Brix value of not less than 62.5 degrees.

For some commodities a range of grades can be delivered, but the price received depends on the grade chosen. For example, in the CME Group's corn futures contract, the standard grade is "No. 2 Yellow," but substitutions are allowed with the price being adjusted in a way established by the exchange. No. 1 Yellow is deliverable for 1.5 cents per bushel more than No. 2 Yellow. No. 3 Yellow is deliverable for 1.5 cents per bushel less than No. 2 Yellow.

The financial assets in futures contracts are generally well defined and unambiguous. For example, there is no need to specify the grade of a Japanese yen. However, there are some interesting features of the Treasury bond and Treasury note futures contracts traded on the Chicago Board of Trade. The underlying asset in the Treasury bond contract is any long-term US Treasury bond that has a maturity of greater than 15 years

---

<sup>1</sup> As mentioned in Chapter 1, the spot price is the price for almost immediate delivery.

and is not callable within 15 years. In the Treasury note futures contract, the underlying asset is any long-term Treasury note with a maturity of no less than 6.5 years and no more than 10 years from the date of delivery. In both cases, the exchange has a formula for adjusting the price received according to the coupon and maturity date of the bond delivered. This is discussed in Chapter 6.

## The Contract Size

The contract size specifies the amount of the asset that has to be delivered under one contract. This is an important decision for the exchange. If the contract size is too large, many investors who wish to hedge relatively small exposures or who wish to take relatively small speculative positions will be unable to use the exchange. On the other hand, if the contract size is too small, trading may be expensive as there is a cost associated with each contract traded.

The correct size for a contract clearly depends on the likely user. Whereas the value of what is delivered under a futures contract on an agricultural product might be \$10,000 to \$20,000, it is much higher for some financial futures. For example, under the Treasury bond futures contract traded by the CME Group, instruments with a face value of \$100,000 are delivered.

In some cases exchanges have introduced “mini” contracts to attract smaller investors. For example, the CME Group’s Mini Nasdaq 100 contract is on 20 times the Nasdaq 100 index, whereas the regular contract is on 100 times the index. (We will cover futures on indices more fully in Chapter 3.)

## Delivery Arrangements

The place where delivery will be made must be specified by the exchange. This is particularly important for commodities that involve significant transportation costs. In the case of the ICE frozen concentrate orange juice contract, delivery is to exchange-licensed warehouses in Florida, New Jersey, or Delaware.

When alternative delivery locations are specified, the price received by the party with the short position is sometimes adjusted according to the location chosen by that party. The price tends to be higher for delivery locations that are relatively far from the main sources of the commodity.

## Delivery Months

A futures contract is referred to by its delivery month. The exchange must specify the precise period during the month when delivery can be made. For many futures contracts, the delivery period is the whole month.

The delivery months vary from contract to contract and are chosen by the exchange to meet the needs of market participants. For example, corn futures traded by the CME Group have delivery months of March, May, July, September, and December. At any given time, contracts trade for the closest delivery month and a number of subsequent delivery months. The exchange specifies when trading in a particular month’s contract will begin. The exchange also specifies the last day on which trading can take place for a given contract. Trading generally ceases a few days before the last day on which delivery can be made.

## Price Quotes

The exchange defines how prices will be quoted. For example, in the US, crude oil futures prices are quoted in dollars and cents. Treasury bond and Treasury note futures prices are quoted in dollars and thirty-seconds of a dollar.

## Price Limits and Position Limits

For most contracts, daily price movement limits are specified by the exchange. If in a day the price moves down from the previous day's close by an amount equal to the daily price limit, the contract is said to be *limit down*. If it moves up by the limit, it is said to be *limit up*. A *limit move* is a move in either direction equal to the daily price limit. Normally, trading ceases for the day once the contract is limit up or limit down. However, in some instances the exchange has the authority to step in and change the limits.

The purpose of daily price limits is to prevent large price movements from occurring because of speculative excesses. However, limits can become an artificial barrier to trading when the price of the underlying commodity is advancing or declining rapidly. Whether price limits are, on balance, good for futures markets is controversial.

Position limits are the maximum number of contracts that a speculator may hold. The purpose of these limits is to prevent speculators from exercising undue influence on the market.

## 2.3 CONVERGENCE OF FUTURES PRICE TO SPOT PRICE

As the delivery period for a futures contract is approached, the futures price converges to the spot price of the underlying asset. When the delivery period is reached, the futures price equals—or is very close to—the spot price.

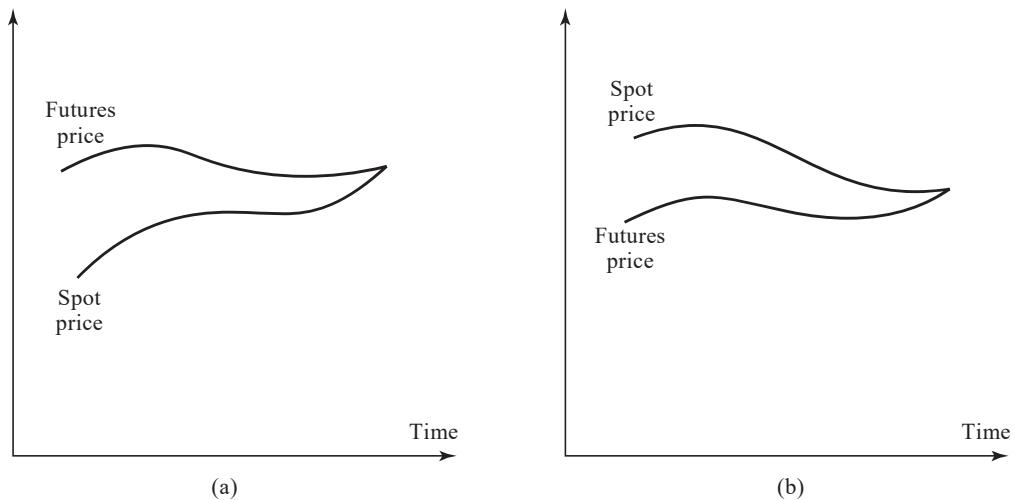
To see why this is so, we first suppose that the futures price is above the spot price during the delivery period. Traders then have a clear arbitrage opportunity:

1. Sell (i.e., short) a futures contract
2. Buy the asset
3. Make delivery.

These steps are certain to lead to a profit equal to the amount by which the futures price exceeds the spot price. As traders exploit this arbitrage opportunity, the futures price will fall. Suppose next that the futures price is below the spot price during the delivery period. Companies interested in acquiring the asset will find it attractive to enter into a long futures contract and then wait for delivery to be made. As they do so, the futures price will tend to rise.

The result is that the futures price is very close to the spot price during the delivery period. Figure 2.1 illustrates the convergence of the futures price to the spot price. In Figure 2.1(a) the futures price is above the spot price prior to the delivery period. In Figure 2.1(b) the futures price is below the spot price prior to the delivery period. The circumstances under which these two patterns are observed are discussed in Chapter 5.

**Figure 2.1** Relationship between futures price and spot price as the delivery period is approached: (a) Futures price above spot price; (b) futures price below spot price.



## 2.4 THE OPERATION OF MARGINS

If two investors get in touch with each other directly and agree to trade an asset in the future for a certain price, there are obvious risks. One of the investors may regret the deal and try to back out. Alternatively, the investor simply may not have the financial resources to honor the agreement. One of the key roles of the exchange is to organize trading so that contract defaults are avoided. This is where margins come in.

### Daily Settlement

To illustrate how margins work, we consider an investor who contacts his or her broker to buy two December gold futures contracts on the COMEX division of the New York Mercantile Exchange (NYMEX), which is part of the CME Group. We suppose that the current futures price is \$1,250 per ounce. Because the contract size is 100 ounces, the investor has contracted to buy a total of 200 ounces at this price. The broker will require the investor to deposit funds in a *margin account*. The amount that must be deposited at the time the contract is entered into is known as the *initial margin*. We suppose this is \$6,000 per contract, or \$12,000 in total. At the end of each trading day, the margin account is adjusted to reflect the investor's gain or loss. This practice is referred to as *daily settlement* or *marking to market*.

Suppose, for example, that by the end of the first day the futures price has dropped by \$9 from \$1,250 to \$1,241. The investor has a loss of \$1,800 ( $= 200 \times \$9$ ), because the 200 ounces of December gold, which the investor contracted to buy at \$1,250, can now be sold for only \$1,241. The balance in the margin account would therefore be reduced by \$1,800 to \$10,200. Similarly, if the price of December gold rose to \$1,259 by the end of the first day, the balance in the margin account would be increased by \$1,800 to \$13,800. A trade is first settled at the close of the day on which it takes place. It is then settled at the close of trading on each subsequent day.

Note that daily settlement is not merely an arrangement between broker and client. When there is a decrease in the futures price so that the margin account of an investor with a long position is reduced by \$1,800, the investor's broker has to pay the exchange \$1,800 and the exchange passes the money on to the broker of an investor with a short position. Similarly, when there is an increase in the futures price, brokers for parties with short positions pay money to the exchange and brokers for parties with long positions receive money from the exchange. Later we will examine in more detail the mechanism by which this happens.

The investor is entitled to withdraw any balance in the margin account in excess of the initial margin. To ensure that the balance in the margin account never becomes negative a *maintenance margin*, which is somewhat lower than the initial margin, is set. If the balance in the margin account falls below the maintenance margin, the investor receives a margin call and is expected to top up the margin account to the initial margin level by the end of the next day. The extra funds deposited are known as a *variation margin*. If the investor does not provide the variation margin, the broker closes out the position. In the case of the investor considered earlier, closing out the position would involve neutralizing the existing contract by selling 200 ounces of gold for delivery in December.

Table 2.1 illustrates the operation of the margin account for one possible sequence of futures prices in the case of the investor considered earlier. The maintenance margin is assumed to be \$4,500 per contract, or \$9,000 in total. On Day 7, the balance in the margin account falls \$1,020 below the maintenance margin level. This drop triggers a

---

**Table 2.1** Operation of margins for a long position in two gold futures contracts. The initial margin is \$6,000 per contract, or \$12,000 in total; the maintenance margin is \$4,500 per contract, or \$9,000 in total. The contract is entered into on Day 1 at \$1,250 and closed out on Day 16 at \$1226.90.

Day	Trade price (\$)	Settlement price (\$)	Daily gain (\$)	Cumulative gain (\$)	Margin account balance (\$)	Margin call (\$)
1	1,250.00				12,000	
1		1,241.00	-1,800	-1,800	10,200	
2		1,238.30	-540	-2,340	9,660	
3		1,244.60	1,260	-1,080	10,920	
4		1,241.30	-660	-1,740	10,260	
5		1,240.10	-240	-1,980	10,020	
6		1,236.20	-780	-2,760	9,240	
7		1,229.90	-1,260	-4,020	7,980	4,020
8		1,230.80	180	-3,840	12,180	
9		1,225.40	-1,080	-4,920	11,100	
10		1,228.10	540	-4,380	11,640	
11		1,211.00	-3,420	-7,800	8,220	3,780
12		1,211.00	0	-7,800	12,000	
13		1,214.30	660	-7,140	12,660	
14		1,216.10	360	-6,780	13,020	
15		1,223.00	1,380	-5,400	14,400	
16	1,226.90		780	-4,620	15,180	

---

margin call from the broker for an additional \$4,020 to bring the account balance up to the initial margin level of \$12,000. It is assumed that the investor provides this margin by the close of trading on Day 8. On Day 11, the balance in the margin account again falls below the maintenance margin level, and a margin call for \$3,780 is sent out. The investor provides this margin by the close of trading on Day 12. On Day 16, the investor decides to close out the position by selling two contracts. The futures price on that day is \$1,226.90, and the investor has a cumulative loss of \$4,620. Note that the investor has excess margin on Days 8, 13, 14, and 15. It is assumed that the excess is not withdrawn.

## Further Details

Most brokers pay investors interest on the balance in a margin account. The balance in the account does not, therefore, represent a true cost, provided that the interest rate is competitive with what could be earned elsewhere. To satisfy the initial margin requirements, but not subsequent margin calls, an investor can usually deposit securities with the broker. Treasury bills are usually accepted in lieu of cash at about 90% of their face value. Shares are also sometimes accepted in lieu of cash, but at about 50% of their market value.

Whereas a forward contract is settled at the end of its life, a futures contract is, as we have seen, settled daily. At the end of each day, the investor's gain (loss) is added to (subtracted from) the margin account, bringing the value of the contract back to zero. A futures contract is in effect closed out and rewritten at a new price each day.

Minimum levels for initial and maintenance margins are set by the exchange. Individual brokers may require greater margins from their clients than those specified by the exchange. However, they cannot require lower margins than those specified by the exchange. Margin levels are determined by the variability of the price of the underlying asset. The higher this variability, the higher the margin levels. The maintenance margin is usually about 75% of the initial margin.

Margin requirements may depend on the objectives of the trader. A bona fide hedger, such as a company that produces the commodity on which the futures contract is written, is often subject to lower margin requirements than a speculator. The reason is that there is deemed to be less risk of default. Day trades and spread transactions often give rise to lower margin requirements than do hedge transactions. In a *day trade* the trader announces to the broker an intent to close out the position in the same day. In a *spread transaction* the trader simultaneously buys (i.e., takes a long position in) a contract on an asset for one maturity month and sells (i.e., takes a short position in) a contract on the same asset for another maturity month.

Note that margin requirements are the same on short futures positions as they are on long futures positions. It is just as easy to take a short futures position as it is to take a long one. The spot market does not have this symmetry. Taking a long position in the spot market involves buying the asset for immediate delivery and presents no problems. Taking a short position involves selling an asset that you do not own. This is a more complex transaction that may or may not be possible in a particular market. It is discussed further in Chapter 5.

## The Clearing House and Clearing Margins

A *clearing house* acts as an intermediary in futures transactions. It guarantees the performance of the parties to each transaction. The clearing house has a number of

members, who must post funds with the clearing house. Brokers who are not members themselves must channel their business through a member. The main task of the clearing house is to keep track of all the transactions that take place during a day, so that it can calculate the net position of each of its members.

Just as an investor is required to maintain a margin account with a broker, the broker is required to maintain a margin account with a clearing house member and the clearing house member is required to maintain a margin account with the clearing house. The latter is known as a *clearing margin*. The margin accounts for clearing house members are adjusted for gains and losses at the end of each trading day in the same way as are the margin accounts of investors. However, in the case of the clearing house member, there is an original margin, but no maintenance margin. Every day the account balance for each contract must be maintained at an amount equal to the original margin times the number of contracts outstanding. Thus, depending on transactions during the day and price movements, the clearing house member may have to add funds to its margin account at the end of the day or it may find it can remove funds from the account at this time. Brokers who are not clearing house members must maintain a margin account with a clearing house member.

In determining clearing margins, the exchange clearing house calculates the number of contracts outstanding on either a gross or a net basis. When the gross basis is used, the number of contracts equals the sum of the long and short positions. When the net basis is used, these are offset against each other. Suppose a clearing house member has two clients: one with a long position in 20 contracts, the other with a short position in 15 contracts. Gross margining would calculate the clearing margin on the basis of 35 contracts; net margining would calculate the clearing margin on the basis of 5 contracts. Most exchanges currently use net margining.

## Credit Risk

The whole purpose of the margining system is to ensure that funds are available to pay traders when they make a profit. Overall the system has been very successful. Traders entering into contracts at major exchanges have always had their contracts honored. Futures markets were tested on October 19, 1987, when the S&P 500 index declined by over 20% and traders with long positions in S&P 500 futures found they had negative margin balances. Traders who did not meet margin calls were closed out but still owed their brokers money. Some did not pay and as a result some brokers went bankrupt because, without their clients' money, they were unable to meet margin calls on contracts they entered into on behalf of their clients. However, the clearing houses had sufficient funds to ensure that everyone who had a short futures position on the S&P 500 got paid off.

## 2.5 OTC MARKETS

Credit risk has traditionally been a feature of the over-the-counter markets. There is always a chance that the party on the other side of an over-the-counter trade will default. It is interesting that, in an attempt to reduce credit risk, the over-the-counter market has adopted, or has been compelled to adopt, some of the procedures used by exchanges.

**Business Snapshot 2.2 Long-Term Capital Management's Big Loss**

Long-Term Capital Management (LTCM), a hedge fund formed in the mid-1990s, always collateralized its transactions. The hedge fund's investment strategy was known as convergence arbitrage. A very simple example of what it might do is the following. It would find two bonds, X and Y, issued by the same company that promised the same payoffs, with X being less liquid (i.e., less actively traded) than Y. The market always places a value on liquidity. As a result the price of X would be less than the price of Y. LTCM would buy X, short Y, and wait, expecting the prices of the two bonds to converge at some future time.

When interest rates increased, the company expected both bonds to move down in price by about the same amount, so that the collateral it paid on bond X would be about the same as the collateral it received on bond Y. Similarly, when interest rates decreased, LTCM expected both bonds to move up in price by about the same amount, so that the collateral it received on bond X would be about the same as the collateral it paid on bond Y. It therefore expected that there would be no significant outflow of funds as a result of its collateralization agreements.

In August 1998, Russia defaulted on its debt and this led to what is termed a "flight to quality" in capital markets. One result was that investors valued liquid instruments more highly than usual and the spreads between the prices of the liquid and illiquid instruments in LTCM's portfolio increased dramatically. The prices of the bonds LTCM had bought went down and the prices of those it had shorted increased. It was required to post collateral on both. The company experienced difficulties because it was highly leveraged. Positions had to be closed out and LTCM lost about \$4 billion. If the company had been less highly leveraged, it would probably have been able to survive the flight to quality and could have waited for the prices of the liquid and illiquid bonds to move back closer to each other.

## Collateralization

Collateralization has been used in OTC markets for some time and is similar to the practice of posting margin in futures markets.

Consider two companies, A and B, that have entered into an OTC derivatives transaction such as a forward. A collateralization agreement applying to the transaction might involve the transaction being valued each day. If, from one day to the next, the value of the transaction to company A increases by a positive amount  $X$  (so that the value to company B decreases by  $X$ ), company B is required to pay  $X$  to company A. Similarly, if the value to company B increases by a positive amount  $X$  (so that the value to company A decreases by  $X$ ), company A is required to pay  $X$  to company B. The contract is not settled daily, as in the case of futures. The payments are a security deposit designed to ensure that obligations will be honored. Interest is paid on the full amount of the funds that have been deposited by one party with the other.

There are many variations on this simple arrangement and collateralization is discussed more fully in Chapter 23. Collateralization significantly reduces the credit risk in OTC contracts. As discussed in Business Snapshot 2.2, it was used by the hedge fund Long-Term Capital Management (LTCM) in the 1990s. As a result LTCM's counterparties were prepared to accept LTCM's credit risk.

## The Use of Clearing Houses in OTC Markets

Since the 2007–2009 crisis, governments in the US and elsewhere have passed legislation requiring clearing houses to be used for some OTC transactions.

The way in which clearing houses work in the OTC market is as follows. An OTC transaction is negotiated between two parties, A and B, in the usual way. It is then presented to a clearing house (sometimes called a central clearing party). Assuming the clearing house accepts the transaction, it becomes the counterparty to both A and B. (This is similar to the way the clearing house for a futures exchange becomes the counterparty to the two sides of a futures trade.) The clearing house takes on the credit risk of both A and B. It manages this risk by requiring an initial margin and daily variation margins from them.

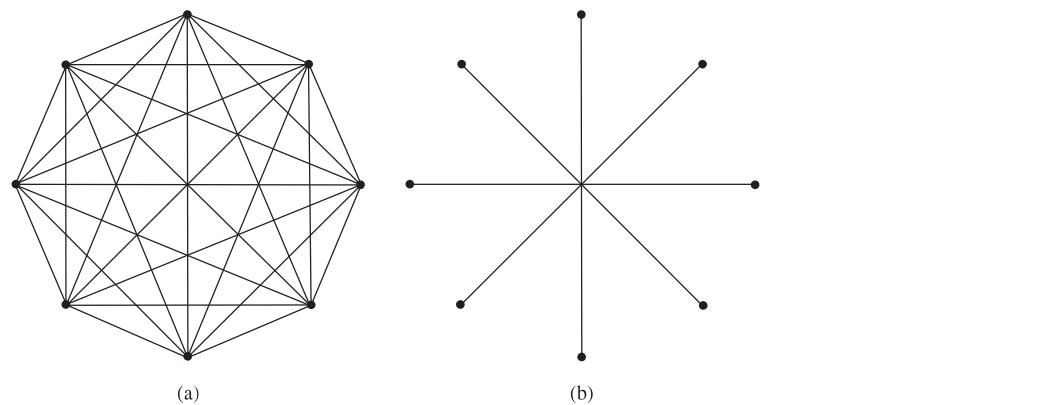
The OTC market has traditionally been a series of bilateral agreements between market participants as illustrated in Figure 2.2a. If all OTC contracts were cleared in the way that has just been described, the OTC market would move to the situation where each participant deals with one or more clearing houses, as illustrated in Figure 2.2b. In practice, because not all OTC transactions are routed through clearing houses, the market has elements of both Figure 2.2a and 2.2b.

A number of arguments have been cited for the use of clearing houses in OTC markets. Collateral will automatically have to be posted; credit risk in the financial system will (hopefully) be reduced;<sup>2</sup> and the trades taking place in the OTC market will become more transparent. A major concern of governments since the credit crisis of 2007 is *systemic risk*. This is the risk that a failure by a large financial institution will lead to failures by other large financial institutions and a collapse of the financial system. The way this can happen is described in Business Snapshot 2.3.

One of the motivations for the legislation requiring that clearing houses be used for OTC transactions is what might be termed the “AIG fiasco.” During the period

---

**Figure 2.2** (a) The traditional way in which OTC markets have operated: a series of bilateral agreements between market participants; (b) how OTC markets would operate with a single central clearing house.



<sup>2</sup> The impact of clearing houses on credit risk depends on the number of clearing houses and the proportion of all OTC trades that are cleared through them. See D. Duffie and H. Zhu (2010), “Does a Central Clearing Counterparty Reduce Counterparty Risk?” Working Paper, Stanford University.

**Business Snapshot 2.3 Systemic risk**

Systemic risk is the risk that a default by one financial institution will create a “ripple effect” that leads to defaults by other financial institutions and threatens the stability of the financial system. There are huge numbers of over-the-counter transactions between banks. If Bank A fails, Bank B may take a huge loss on the transactions it has with Bank A. This in turn could lead to Bank B failing. Bank C that has many outstanding transactions with both Bank A and Bank B might then take a large loss and experience severe financial difficulties; and so on.

The financial system has survived defaults such as Drexel in 1990 and Lehman Brothers in 2008, but regulators continue to be concerned. During the market turmoil of 2007 and 2008, many large financial institutions were bailed out, rather than being allowed to fail, because governments were concerned about systemic risk.

leading up to the credit crisis, the insurance company AIG provided protection to other financial institutions against a huge volume of credit risks that were related to subprime mortgages. Since AIG had a AAA credit rating at the time the transactions were negotiated, it was not required to post collateral by its counterparties. The transactions resulted in big losses for AIG and led to an \$85 billion bailout of the company by the US government. Whether the clearing house legislation by itself will prevent companies taking risks as large as those of AIG in the future is doubtful. This is because the legislation applies only to “standardized” OTC transactions and AIG’s transactions were nonstandard. However, mandatory collateralization for nonstandard OTC contracts will go a long way toward preventing another AIG occurring in the future.

## 2.6 MARKET QUOTES

Futures quotes are available from exchanges and from several online sources (see, for example, [futures.tradingcharts.com/marketquotes](http://futures.tradingcharts.com/marketquotes)). Table 2.2 shows quotes provided by exchanges for a number of different commodities on May 26, 2010. Quotes for index, currency, and interest rate futures are given in Chapters 3, 5, and 6, respectively.

The asset underlying the futures contract, the exchange that the contract is traded on, the contract size, and how the price is quoted are all shown at the top of each section in Table 2.2. The first asset is gold, traded on COMEX (a division of the New York Mercantile Exchange, which is now part of the CME Group). The contract size is 100 ounces, and the price is quoted in dollars per ounce. The maturity month of the contract is shown in the first column.

### Prices

The first three numbers in each row show the opening price, the highest price achieved in trading during the day, and the lowest price achieved in trading during the day. The opening price is representative of the prices at which contracts were trading immediately after the start of trading. For June 2010 gold, the opening price on May 26, 2010, was \$1,203.80. During the day, the price traded between \$1,201.00 and \$1,216.90.

**Table 2.2** Futures quotes for a selection of CME Group contracts on commodities on May 26, 2010.

	<i>Open</i>	<i>High</i>	<i>Low</i>	<i>Settlement</i>	<i>Change</i>	<i>Volume</i>	<i>Open interest</i>
<b>Gold 100 oz, \$ per oz</b>							
June 2010	1203.80	1216.90	1201.00	1213.40	15.40	194,461	156,156
July 2010	1205.00	1217.50	1202.00	1214.20	15.50	838	714
Aug. 2010	1205.00	1218.70	1202.70	1215.30	15.50	130,676	240,074
Oct. 2010	1208.30	1220.20	1205.30	1217.50	15.60	2,445	21,792
Dec. 2010	1208.80	1222.90	1207.50	1219.90	15.60	7,885	61,497
June 2011	1215.90	1228.00	1215.20	1227.80	15.80	408	13,461
<b>Crude oil 1,000 barrels, \$ per barrel</b>							
July 2010	70.06	71.70	69.21	71.51	2.76	6,315	388,902
Aug. 2010	71.25	72.77	70.42	72.54	2.44	3,746	115,305
Dec. 2010	74.00	75.34	73.17	75.23	2.19	5,055	196,033
Dec. 2011	77.01	78.59	76.51	78.53	2.00	4,175	100,674
Dec. 2012	78.50	80.21	78.50	80.18	1.86	1,258	70,126
<b>Corn 5,000 bushels, cents per bushel</b>							
July 2010	369.50	372.00	368.75	371.50	7.25	122,528	491,587
Sept. 2010	379.50	381.00	379.00	381.00	7.75	24,186	175,798
Dec. 2010	389.00	390.75	380.25	390.75	8.00	47,428	373,026
Mar. 2011	400.00	403.25	400.00	403.25	7.75	4,581	55,836
May 2011	410.50	411.50	410.50	411.50	7.25	830	8,995
July 2011	417.50	419.50	417.50	419.50	7.50	3,491	31,939
Dec. 2011	416.25	418.00	415.75	418.00	7.25	4,760	59,061
<b>Soybeans 5,000 bushels, cents per bushel</b>							
July 2010	934.25	939.75	933.00	938.00	7.50	41,816	220,712
Aug. 2010	922.00	931.50	922.00	929.50	8.50	4,881	15,674
Sept. 2010	914.50	918.75	912.50	916.50	7.00	1,935	12,983
Nov. 2010	906.00	912.50	905.00	910.00	7.00	18,908	157,826
Jan. 2011	917.75	921.50	914.75	919.75	7.00	2,621	12,391
Mar. 2011	926.00	930.00	925.00	928.50	8.00	1,406	5,857
May 2011	933.50	935.50	931.00	933.50	7.50	942	5,626
<b>Wheat 5,000 bushels, cents per bushel</b>							
July 2010	462.75	472.00	459.00	461.75	1.25	45,283	246,683
Sept. 2010	480.00	489.00	476.50	479.00	1.00	13,941	90,257
Dec. 2010	510.75	519.50	507.25	510.00	1.25	9,756	70,618
Mar. 2011	541.50	548.50	536.75	539.00	0.75	2,748	27,879
May 2011	557.00	563.50	552.75	555.50	1.25	923	8,199
July 2011	574.25	583.00	571.00	573.75	0.75	4,938	34,300
<b>Live Cattle 40,000 lb, cents per lb</b>							
June 2010	90.800	90.850	90.450	90.800	0.775	12,410	51,817
Aug. 2010	89.700	90.050	89.525	89.925	0.850	19,341	144,587
Oct. 2010	91.100	91.150	90.750	91.100	0.750	7,718	78,300
Dec. 2010	92.100	92.250	91.875	92.175	0.800	3,347	42,102
Feb. 2011	93.200	93.550	93.200	93.550	0.800	792	18,428

## Settlement Price

The fourth number is the *settlement price*. This is the price used for calculating daily gains and losses and margin requirements. It is usually calculated as the price at which the contract traded immediately before the end of a day's trading session (1:30 p.m. for gold). The fifth number is the change in the settlement price from the previous day. For the June 2010 gold futures contract, the settlement price on May 26, 2010, was \$1,213.40, up \$15.40 from the previous trading day. In this case, an investor with a long position in one contract would find his or her margin account balance increased by \$1,540 ( $= 100 \times \$15.40$ ) on March 26, 2010. Similarly, an investor with a short position in one contract would find that the margin balance decreased by \$1,540 on this date.

The numbers in the fifth column show that, by chance, settlement prices for all the contracts considered increased between May 25 and May 26, 2010.

## Trading Volume and Open Interest

The final two columns in Table 2.2 show the trading volume for the day and the open interest at the end of the previous day. The trading volume is the number of contracts traded. The open interest is the number of contracts outstanding, that is, the number of long positions or, equivalently, the number of short positions.

Trading volume can be greater than both the beginning-of-day and end-of-day open interest. (This was the case for June 2010 gold on May 26, 2010.) This indicates that many traders who entered into positions during the day closed them out before the end of the day. (Traders who do this are referred to as *day traders*.)

## Patterns of Futures Prices

Futures prices can show a number of different patterns. The futures price of gold generally increases with the maturity of the contract. Table 2.2 shows that this was the case on May 26, 2010. The settlement price on that day increased from \$1213.40 to \$1227.80 as the contract maturity month increased from June 2010 to June 2011. Markets where the futures price is an increasing function of the time to maturity are known as *normal markets*. Markets where the futures price decreases with the maturity of the futures contract are known as *inverted markets*.<sup>3</sup>

Table 2.2 shows that there was a normal market for crude oil on May 26, 2010. This is not always the case. For example, on October 15, 2007, oil futures prices were inverted. The November 2007, December 2007, January 2008, February 2008, March 2008, and April 2008 settlement prices were 86.13, 85.13, 84.25, 83.41, 82.69, and 82.05, respectively. Sometimes futures prices, perhaps because of seasonality, show a mixture of normal and inverted markets. For example, on May 26, 2010, the futures price of soybeans first decreased and then increased as the maturity of the contract increased.

---

<sup>3</sup> The term *contango* is sometimes used to describe situations where the futures price is an increasing function of the maturity of the contract and the term *backwardation* is sometimes used to describe the situation where the futures price is a decreasing function of the maturity of the contract. Strictly speaking, as will be explained in Chapter 5, these terms refer to whether the price of the underlying asset is expected to increase or decrease over time.

## 2.7 DELIVERY

As mentioned earlier in this chapter, very few of the futures contracts that are entered into lead to delivery of the underlying asset. Most are closed out early. Nevertheless, it is the possibility of eventual delivery that determines the futures price. An understanding of delivery procedures is therefore important.

The period during which delivery can be made is defined by the exchange and varies from contract to contract. The decision on when to deliver is made by the party with the short position, whom we shall refer to as investor A. When investor A decides to deliver, investor A's broker issues a notice of intention to deliver to the exchange clearing house. This notice states how many contracts will be delivered and, in the case of commodities, also specifies where delivery will be made and what grade will be delivered. The exchange then chooses a party with a long position to accept delivery.

Suppose that the party on the other side of investor A's futures contract when it was entered into was investor B. It is important to realize that there is no reason to expect that it will be investor B who takes delivery. Investor B may well have closed out his or her position by trading with investor C, investor C may have closed out his or her position by trading with investor D, and so on. The usual rule chosen by the exchange is to pass the notice of intention to deliver on to the party with the oldest outstanding long position. Parties with long positions must accept delivery notices. However, if the notices are transferable, long investors have a short period of time, usually half an hour, to find another party with a long position that is prepared to accept the notice from them.

In the case of a commodity, taking delivery usually means accepting a warehouse receipt in return for immediate payment. The party taking delivery is then responsible for all warehousing costs. In the case of livestock futures, there may be costs associated with feeding and looking after the animals (see Business Snapshot 2.1). In the case of financial futures, delivery is usually made by wire transfer. For all contracts, the price paid is usually the most recent settlement price. If specified by the exchange, this price is adjusted for grade, location of delivery, and so on. The whole delivery procedure from the issuance of the notice of intention to deliver to the delivery itself generally takes about two to three days.

There are three critical days for a contract. These are the first notice day, the last notice day, and the last trading day. The *first notice day* is the first day on which a notice of intention to make delivery can be submitted to the exchange. The *last notice day* is the last such day. The *last trading day* is generally a few days before the last notice day. To avoid the risk of having to take delivery, an investor with a long position should close out his or her contracts prior to the first notice day.

### Cash Settlement

Some financial futures, such as those on stock indices discussed in Chapter 3, are settled in cash because it is inconvenient or impossible to deliver the underlying asset. In the case of the futures contract on the S&P 500, for example, delivering the underlying asset would involve delivering a portfolio of 500 stocks. When a contract is settled in cash, all outstanding contracts are declared closed on a predetermined day. The final settlement price is set equal to the spot price of the underlying asset at either the opening or close of trading on that day. For example, in the S&P 500 futures contract traded by the

CME Group, the predetermined day is the third Friday of the delivery month and final settlement is at the opening price.

## 2.8 TYPES OF TRADERS AND TYPES OF ORDERS

There are two main types of traders executing trades: *futures commission merchants* (FCMs) and *locals*. FCMs are following the instructions of their clients and charge a commission for doing so; locals are trading on their own account.

Individuals taking positions, whether locals or the clients of FCMs, can be categorized as hedgers, speculators, or arbitrageurs, as discussed in Chapter 1. Speculators can be classified as scalpers, day traders, or position traders. *Scalpers* are watching for very short-term trends and attempt to profit from small changes in the contract price. They usually hold their positions for only a few minutes. *Day traders* hold their positions for less than one trading day. They are unwilling to take the risk that adverse news will occur overnight. *Position traders* hold their positions for much longer periods of time. They hope to make significant profits from major movements in the markets.

### Orders

The simplest type of order placed with a broker is a *market order*. It is a request that a trade be carried out immediately at the best price available in the market. However, there are many other types of orders. We will consider those that are more commonly used.

A *limit order* specifies a particular price. The order can be executed only at this price or at one more favorable to the investor. Thus, if the limit price is \$30 for an investor wanting to buy, the order will be executed only at a price of \$30 or less. There is, of course, no guarantee that the order will be executed at all, because the limit price may never be reached.

A *stop order* or *stop-loss order* also specifies a particular price. The order is executed at the best available price once a bid or offer is made at that particular price or a less-favorable price. Suppose a stop order to sell at \$30 is issued when the market price is \$35. It becomes an order to sell when and if the price falls to \$30. In effect, a stop order becomes a market order as soon as the specified price has been hit. The purpose of a stop order is usually to close out a position if unfavorable price movements take place. It limits the loss that can be incurred.

A *stop-limit order* is a combination of a stop order and a limit order. The order becomes a limit order as soon as a bid or offer is made at a price equal to or less favorable than the stop price. Two prices must be specified in a stop-limit order: the stop price and the limit price. Suppose that at the time the market price is \$35, a stop-limit order to buy is issued with a stop price of \$40 and a limit price of \$41. As soon as there is a bid or offer at \$40, the stop-limit becomes a limit order at \$41. If the stop price and the limit price are the same, the order is sometimes called a *stop-and-limit order*.

A *market-if-touched* (MIT) order is executed at the best available price after a trade occurs at a specified price or at a price more favorable than the specified price. In effect, an MIT becomes a market order once the specified price has been hit. An MIT is also known as a *board order*. Consider an investor who has a long position in a futures contract and is issuing instructions that would lead to closing out the contract. A stop order is designed to place a limit on the loss that can occur in the event of unfavorable

price movements. By contrast, a market-if-touched order is designed to ensure that profits are taken if sufficiently favorable price movements occur.

A *discretionary order* or *market-not-held order* is traded as a market order except that execution may be delayed at the broker's discretion in an attempt to get a better price.

Some orders specify time conditions. Unless otherwise stated, an order is a day order and expires at the end of the trading day. A *time-of-day order* specifies a particular period of time during the day when the order can be executed. An *open order* or a *good-till-canceled order* is in effect until executed or until the end of trading in the particular contract. A *fill-or-kill order*, as its name implies, must be executed immediately on receipt or not at all.

## 2.9 REGULATION

Futures markets in the United States are currently regulated federally by the Commodity Futures Trading Commission (CFTC; [www.cftc.gov](http://www.cftc.gov)), which was established in 1974. This body is responsible for licensing futures exchanges and approving contracts. All new contracts and changes to existing contracts must be approved by the CFTC. To be approved, the contract must have some useful economic purpose. Usually this means that it must serve the needs of hedgers as well as speculators.

The CFTC looks after the public interest. It is responsible for ensuring that prices are communicated to the public and that futures traders report their outstanding positions if they are above certain levels. The CFTC also licenses all individuals who offer their services to the public in futures trading. The backgrounds of these individuals are investigated, and there are minimum capital requirements. The CFTC deals with complaints brought by the public and ensures that disciplinary action is taken against individuals when appropriate. It has the authority to force exchanges to take disciplinary action against members who are in violation of exchange rules.

With the formation of the National Futures Association (NFA; [www.nfa.futures.org](http://www.nfa.futures.org)) in 1982, some of responsibilities of the CFTC were shifted to the futures industry itself. The NFA is an organization of individuals who participate in the futures industry. Its objective is to prevent fraud and to ensure that the market operates in the best interests of the general public. It is authorized to monitor trading and take disciplinary action when appropriate. The agency has set up an efficient system for arbitrating disputes between individuals and its members.

From time to time, other bodies, such as the Securities and Exchange Commission (SEC; [www.sec.gov](http://www.sec.gov)), the Federal Reserve Board ([www.federalreserve.gov](http://www.federalreserve.gov)), and the US Treasury Department ([www.treas.gov](http://www.treas.gov)), have claimed jurisdictional rights over some aspects of futures trading. These bodies are concerned with the effects of futures trading on the spot markets for securities such as stocks, Treasury bills, and Treasury bonds. The SEC currently has an effective veto over the approval of new stock or bond index futures contracts. However, the basic responsibility for all futures and options on futures rests with the CFTC.

### Trading Irregularities

Most of the time futures markets operate efficiently and in the public interest. However, from time to time, trading irregularities do come to light. One type of trading

irregularity occurs when an investor group tries to “corner the market.”<sup>4</sup> The investor group takes a huge long futures position and also tries to exercise some control over the supply of the underlying commodity. As the maturity of the futures contracts is approached, the investor group does not close out its position, so that the number of outstanding futures contracts may exceed the amount of the commodity available for delivery. The holders of short positions realize that they will find it difficult to deliver and become desperate to close out their positions. The result is a large rise in both futures and spot prices. Regulators usually deal with this type of abuse of the market by increasing margin requirements or imposing stricter position limits or prohibiting trades that increase a speculator’s open position or requiring market participants to close out their positions.

Other types of trading irregularity can involve the traders on the floor of the exchange. These received some publicity early in 1989, when it was announced that the FBI had carried out a two-year investigation, using undercover agents, of trading on the Chicago Board of Trade and the Chicago Mercantile Exchange. The investigation was initiated because of complaints filed by a large agricultural concern. The alleged offenses included overcharging customers, not paying customers the full proceeds of sales, and traders using their knowledge of customer orders to trade first for themselves (an offence known as *front running*).

## 2.10 ACCOUNTING AND TAX

The full details of the accounting and tax treatment of futures contracts are beyond the scope of this book. A trader who wants detailed information on this should consult experts. In this section we provide some general background information.

### Accounting

Accounting standards require changes in the market value of a futures contract to be recognized when they occur unless the contract qualifies as a hedge. If the contract does qualify as a hedge, gains or losses are generally recognized for accounting purposes in the same period in which the gains or losses from the item being hedged are recognized. The latter treatment is referred to as *hedge accounting*.

Consider a company with a December year end. In September 2011 it buys a March 2012 corn futures contract and closes out the position at the end of February 2012. Suppose that the futures prices are 250 cents per bushel when the contract is entered into, 270 cents per bushel at the end of 2011, and 280 cents per bushel when the contract is closed out. The contract is for the delivery of 5,000 bushels. If the contract does not qualify as a hedge, the gains for accounting purposes are

$$5,000 \times (2.70 - 2.50) = \$1,000$$

in 2011 and

$$5,000 \times (2.80 - 2.70) = \$500$$

---

<sup>4</sup> Possibly the best known example of this was the attempt by the Hunt brothers to corner the silver market in 1979–80. Between the middle of 1979 and the beginning of 1980, their activities led to a price rise from \$6 per ounce to \$50 per ounce.

in 2012. If the company is hedging the purchase of 5,000 bushels of corn in February 2012 so that the contract qualifies for hedge accounting, the entire gain of \$1,500 is realized in 2012 for accounting purposes.

The treatment of hedging gains and losses is sensible. If the company is hedging the purchase of 5,000 bushels of corn in February 2012, the effect of the futures contract is to ensure that the price paid is close to 250 cents per bushel. The accounting treatment reflects that this price is paid in 2012.

In June 1998, the Financial Accounting Standards Board issued Statement No. 133 (FAS 133), Accounting for Derivative Instruments and Hedging Activities. FAS 133 applies to all types of derivatives (including futures, forwards, swaps, and options). It requires all derivatives to be included on the balance sheet at fair market value.<sup>5</sup> It increases disclosure requirements. It also gives companies far less latitude than previously in using hedge accounting. For hedge accounting to be used, the hedging instrument must be highly effective in offsetting exposures and an assessment of this effectiveness is required every three months. A similar standard IAS 39 has been issued by the International Accounting Standards Board.

## Tax

Under the US tax rules, two key issues are the nature of a taxable gain or loss and the timing of the recognition of the gain or loss. Gains or losses are either classified as capital gains or losses or alternatively as part of ordinary income.

For a corporate taxpayer, capital gains are taxed at the same rate as ordinary income, and the ability to deduct losses is restricted. Capital losses are deductible only to the extent of capital gains. A corporation may carry back a capital loss for three years and carry it forward for up to five years. For a noncorporate taxpayer, short-term capital gains are taxed at the same rate as ordinary income, but long-term capital gains are subject to a maximum capital gains tax rate of 15%. (Long-term capital gains are gains from the sale of a capital asset held for longer than one year; short-term capital gains are the gains from the sale of a capital asset held one year or less.) For a noncorporate taxpayer, capital losses are deductible to the extent of capital gains plus ordinary income up to \$3,000 and can be carried forward indefinitely.

Generally, positions in futures contracts are treated as if they are closed out on the last day of the tax year. For the noncorporate taxpayer, this gives rise to capital gains and losses that are treated as if they were 60% long term and 40% short term without regard to the holding period. This is referred to as the “60/40” rule. A noncorporate taxpayer may elect to carry back for three years any net losses from the 60/40 rule to offset any gains recognized under the rule in the previous three years.

Hedging transactions are exempt from this rule. The definition of a hedge transaction for tax purposes is different from that for accounting purposes. The tax regulations define a hedging transaction as a transaction entered into in the normal course of business primarily for one of the following reasons:

1. To reduce the risk of price changes or currency fluctuations with respect to property that is held or to be held by the taxpayer for the purposes of producing ordinary income

---

<sup>5</sup> Previously the attraction of derivatives in some situations was that they were “off-balance-sheet” items.

2. To reduce the risk of price or interest rate changes or currency fluctuations with respect to borrowings made by the taxpayer.

A hedging transaction must be clearly identified as such in the company's records. Gains or losses from hedging transactions are treated as ordinary income. The timing of the recognition of gains or losses from hedging transactions generally matches the timing of the recognition of income or expense associated with the transaction being hedged.

## 2.11 FORWARD vs. FUTURES CONTRACTS

The main differences between forward and futures contracts are summarized in Table 2.3. Both contracts are agreements to buy or sell an asset for a certain price at a certain future time. A forward contract is traded in the over-the-counter market and there is no standard contract size or standard delivery arrangements. A single delivery date is usually specified and the contract is usually held to the end of its life and then settled. A futures contract is a standardized contract traded on an exchange. A range of delivery dates is usually specified. It is settled daily and usually closed out prior to maturity.

### Profits from Forward and Futures Contracts

Suppose that the sterling exchange rate for a 90-day forward contract is 1.5000 and that this rate is also the futures price for a contract that will be delivered in exactly 90 days. What is the difference between the gains and losses under the two contracts?

Under the forward contract, the whole gain or loss is realized at the end of the life of the contract. Under the futures contract, the gain or loss is realized day by day because of the daily settlement procedures. Suppose that investor A is long £1 million in a 90-day forward contract and investor B is long £1 million in 90-day futures contracts. (Because each futures contract is for the purchase or sale of £62,500, investor B must purchase a total of 16 contracts.) Assume that the spot exchange rate in 90 days proves to be 1.7000 dollars per pound. Investor A makes a gain of \$200,000 on the 90th day. Investor B makes the same gain—but spread out over the 90-day period. On some days investor B may realize a loss, whereas on other days he

---

**Table 2.3** Comparison of forward and futures contracts.

<i>Forward</i>	<i>Futures</i>
Private contract between two parties	Traded on an exchange
Not standardized	Standardized contract
Usually one specified delivery date	Range of delivery dates
Settled at end of contract	Settled daily
Delivery or final cash settlement usually takes place	Contract is usually closed out prior to maturity
Some credit risk	Virtually no credit risk

---

or she makes a gain. However, in total, when losses are netted against gains, there is a gain of \$200,000 over the 90-day period.

## Foreign Exchange Quotes

Both forward and futures contracts trade actively on foreign currencies. However, there is sometimes a difference in the way exchange rates are quoted in the two markets. For example, futures prices where one currency is the US dollar are always quoted as the number of US dollars per unit of the foreign currency or as the number of US cents per unit of the foreign currency. Forward prices are always quoted in the same way as spot prices. This means that, for the British pound, the euro, the Australian dollar, and the New Zealand dollar, the forward quotes show the number of US dollars per unit of the foreign currency and are directly comparable with futures quotes. For other major currencies, forward quotes show the number of units of the foreign currency per US dollar (USD). Consider the Canadian dollar (CAD). A futures price quote of 0.9500 USD per CAD corresponds to a forward price quote of 1.0526 CAD per USD ( $1.0526 = 1/0.9500$ ).

## SUMMARY

A very high proportion of the futures contracts that are traded do not lead to the delivery of the underlying asset. Traders usually enter into offsetting contracts to close out their positions before the delivery period is reached. However, it is the possibility of final delivery that drives the determination of the futures price. For each futures contract, there is a range of days during which delivery can be made and a well-defined delivery procedure. Some contracts, such as those on stock indices, are settled in cash rather than by delivery of the underlying asset.

The specification of contracts is an important activity for a futures exchange. The two sides to any contract must know what can be delivered, where delivery can take place, and when delivery can take place. They also need to know details on the trading hours, how prices will be quoted, maximum daily price movements, and so on. New contracts must be approved by the Commodity Futures Trading Commission before trading starts.

Margins are an important aspect of futures markets. An investor keeps a margin account with his or her broker. The account is adjusted daily to reflect gains or losses, and from time to time the broker may require the account to be topped up if adverse price movements have taken place. The broker either must be a clearing house member or must maintain a margin account with a clearing house member. Each clearing house member maintains a margin account with the exchange clearing house. The balance in the account is adjusted daily to reflect gains and losses on the business for which the clearing house member is responsible.

Information on futures prices is collected in a systematic way at exchanges and relayed within a matter of seconds to investors throughout the world. Many daily newspapers such as the *Wall Street Journal* carry a summary of the previous day's trading.

Forward contracts differ from futures contracts in a number of ways. Forward contracts are private arrangements between two parties, whereas futures contracts are

traded on exchanges. There is generally a single delivery date in a forward contract, whereas futures contracts frequently involve a range of such dates. Because they are not traded on exchanges, forward contracts do not need to be standardized. A forward contract is not usually settled until the end of its life, and most contracts do in fact lead to delivery of the underlying asset or a cash settlement at this time.

In the next few chapters we shall examine in more detail the ways in which forward and futures contracts can be used for hedging. We shall also look at how forward and futures prices are determined.

## FURTHER READING

- Duffie, D., and H. Zhu. "Does a Central Clearing Counterparty Reduce Counterparty Risk?" Working Paper, Stanford University, 2010.
- Gastineau, G. L., D.J. Smith, and R. Todd. *Risk Management, Derivatives, and Financial Analysis under SFAS No. 133*. The Research Foundation of AIMR and Blackwell Series in Finance, 2001.
- Hull, J., "OTC Derivatives and Central Clearing: Can All Transactions Be Cleared," *Financial Stability Review*, 14 (July 2010): 71–80.
- Jones, F. J., and R. J. Teweles. In: *The Futures Game*, edited by B. Warwick, 3rd edn. New York: McGraw-Hill, 1998.
- Jorion, P. "Risk Management Lessons from Long-Term Capital Management," *European Financial Management*, 6, 3 (September 2000): 277–300.
- Kawaller, I. G., and P. D. Koch. "Meeting the Highly Effective Expectation Criterion for Hedge Accounting," *Journal of Derivatives*, 7, 4 (Summer 2000): 79–87.
- Lowenstein, R. *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. New York: Random House, 2000.

## Practice Questions (Answers in Solutions Manual)

- 2.1. Distinguish between the terms *open interest* and *trading volume*.
- 2.2. What is the difference between a *local* and a *futures commission merchant*?
- 2.3. Suppose that you enter into a short futures contract to sell July silver for \$17.20 per ounce. The size of the contract is 5,000 ounces. The initial margin is \$4,000, and the maintenance margin is \$3,000. What change in the futures price will lead to a margin call? What happens if you do not meet the margin call?
- 2.4. Suppose that in September 2012 a company takes a long position in a contract on May 2013 crude oil futures. It closes out its position in March 2013. The futures price (per barrel) is \$68.30 when it enters into the contract, \$70.50 when it closes out its position, and \$69.10 at the end of December 2012. One contract is for the delivery of 1,000 barrels. What is the company's total profit? When is it realized? How is it taxed if it is (a) a hedger and (b) a speculator? Assume that the company has a December 31 year-end.
- 2.5. What does a stop order to sell at \$2 mean? When might it be used? What does a limit order to sell at \$2 mean? When might it be used?
- 2.6. What is the difference between the operation of the margin accounts administered by a clearing house and those administered by a broker?

- 2.7. What differences exist in the way prices are quoted in the foreign exchange futures market, the foreign exchange spot market, and the foreign exchange forward market?
- 2.8. The party with a short position in a futures contract sometimes has options as to the precise asset that will be delivered, where delivery will take place, when delivery will take place, and so on. Do these options increase or decrease the futures price? Explain your reasoning.
- 2.9. What are the most important aspects of the design of a new futures contract?
- 2.10. Explain how margins protect investors against the possibility of default.
- 2.11. A trader buys two July futures contracts on orange juice. Each contract is for the delivery of 15,000 pounds. The current futures price is 160 cents per pound, the initial margin is \$6,000 per contract, and the maintenance margin is \$4,500 per contract. What price change would lead to a margin call? Under what circumstances could \$2,000 be withdrawn from the margin account?
- 2.12. Show that, if the futures price of a commodity is greater than the spot price during the delivery period, then there is an arbitrage opportunity. Does an arbitrage opportunity exist if the futures price is less than the spot price? Explain your answer.
- 2.13. Explain the difference between a market-if-touched order and a stop order.
- 2.14. Explain what a stop-limit order to sell at 20.30 with a limit of 20.10 means.
- 2.15. At the end of one day a clearing house member is long 100 contracts, and the settlement price is \$50,000 per contract. The original margin is \$2,000 per contract. On the following day the member becomes responsible for clearing an additional 20 long contracts, entered into at a price of \$51,000 per contract. The settlement price at the end of this day is \$50,200. How much does the member have to add to its margin account with the exchange clearing house?
- 2.16. On July 1, 2012, a Japanese company enters into a forward contract to buy \$1 million with yen on January 1, 2013. On September 1, 2012, it enters into a forward contract to sell \$1 million on January 1, 2013. Describe the profit or loss the company will make in yen as a function of the forward exchange rates on July 1, 2012, and September 1, 2012.
- 2.17. The forward price of the Swiss franc for delivery in 45 days is quoted as 1.1000. The futures price for a contract that will be delivered in 45 days is 0.9000. Explain these two quotes. Which is more favorable for an investor wanting to sell Swiss francs?
- 2.18. Suppose you call your broker and issue instructions to sell one July hogs contract. Describe what happens.
- 2.19. “Speculation in futures markets is pure gambling. It is not in the public interest to allow speculators to trade on a futures exchange.” Discuss this viewpoint.
- 2.20. Live cattle futures trade with June, August, October, December, February, and April maturities. Why do you think the open interest for the June contract is less than that for the August contract in Table 2.2?
- 2.21. What do you think would happen if an exchange started trading a contract in which the quality of the underlying asset was incompletely specified?
- 2.22. “When a futures contract is traded on the floor of the exchange, it may be the case that the open interest increases by one, stays the same, or decreases by one.” Explain this statement.

- 2.23. Suppose that, on October 24, 2012, a company sells one April 2013 live cattle futures contract. It closes out its position on January 21, 2013. The futures price (per pound) is 91.20 cents when it enters into the contract, 88.30 cents when it closes out its position, and 88.80 cents at the end of December 2012. One contract is for the delivery of 40,000 pounds of cattle. What is the total profit? How is it taxed if the company is (a) a hedger and (b) a speculator? Assume that the company has a December 31 year-end.
- 2.24. A cattle farmer expects to have 120,000 pounds of live cattle to sell in 3 months. The live cattle futures contract traded by the CME Group is for the delivery of 40,000 pounds of cattle. How can the farmer use the contract for hedging? From the farmer's viewpoint, what are the pros and cons of hedging?
- 2.25. It is July 2011. A mining company has just discovered a small deposit of gold. It will take 6 months to construct the mine. The gold will then be extracted on a more or less continuous basis for 1 year. Futures contracts on gold are available with delivery months every 2 months from August 2011 to December 2012. Each contract is for the delivery of 100 ounces. Discuss how the mining company might use futures markets for hedging.

## Further Questions

- 2.26. Trader A enters into futures contracts to buy 1 million euros for 1.4 million dollars in three months. Trader B enters in a forward contract to do the same thing. The exchange rate (dollars per euro) declines sharply during the first two months and then increases for the third month to close at 1.4300. Ignoring daily settlement, what is the total profit of each trader? When the impact of daily settlement is taken into account, which trader has done better?
- 2.27. Explain what is meant by open interest. Why does the open interest usually decline during the month preceding the delivery month? On a particular day, there were 2,000 trades in a particular futures contract. This means that there were 2,000 buyers (going long) and 2,000 sellers (going short). Of the 2,000 buyers, 1,400 were closing out positions and 600 were entering into new positions. Of the 2,000 sellers, 1,200 were closing out positions and 800 were entering into new positions. What is the impact of the day's trading on open interest?
- 2.28. One orange juice futures contract is on 15,000 pounds of frozen concentrate. Suppose that in September 2011 a company sells a March 2013 orange juice futures contract for 120 cents per pound. In December 2011, the futures price is 140 cents; in December 2012, it is 110 cents; and in February 2013, it is closed out at 125 cents. The company has a December year end. What is the company's profit or loss on the contract? How is it realized? What is the accounting and tax treatment of the transaction if the company is classified as (a) a hedger and (b) a speculator?
- 2.29. A company enters into a short futures contract to sell 5,000 bushels of wheat for 450 cents per bushel. The initial margin is \$3,000 and the maintenance margin is \$2,000. What price change would lead to a margin call? Under what circumstances could \$1,500 be withdrawn from the margin account?
- 2.30. Suppose that there are no storage costs for crude oil and the interest rate for borrowing or lending is 5% per annum. How could you make money on May 26, 2010, by trading July 2010 and December 2010 contracts? Use Table 2.2.

- 2.31. What position is equivalent to a long forward contract to buy an asset at  $K$  on a certain date and a put option to sell it for  $K$  on that date.
- 2.32. The author's website ([www.rotman.utoronto.ca/~hull/data](http://www.rotman.utoronto.ca/~hull/data)) contains daily closing prices for crude oil and gold futures contracts. You are required to download the data and answer the following:
  - (a) How high do the maintenance margin levels for oil and gold have to be set so that there is a 1% chance that an investor with a balance slightly above the maintenance margin level on a particular day has a negative balance 2 days later? How high do they have to be for a 0.1% chance? Assume daily price changes are normally distributed with mean zero. Explain why the exchange might be interested in this calculation.
  - (b) Imagine an investor who starts with a long position in the oil contract at the beginning of the period covered by the data and keeps the contract for the whole of the period of time covered by the data. Margin balances in excess of the initial margin are withdrawn. Use the maintenance margin you calculated in part (a) for a 1% risk level and assume that the maintenance margin is 75% of the initial margin. Calculate the number of margin calls and the number of times the investor has a negative margin balance. Assume that all margin calls are met in your calculations. Repeat the calculations for an investor who starts with a short position in the gold contract.