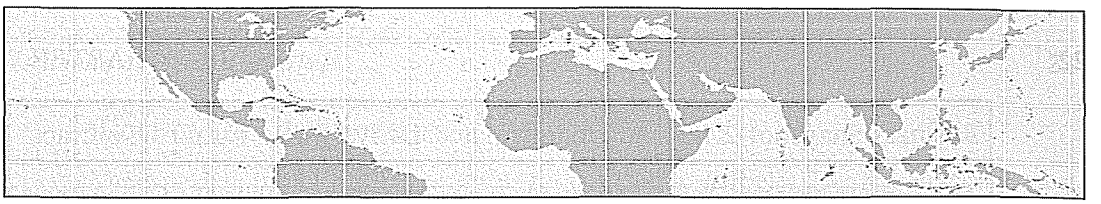


CHAPTER 2

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 corporate 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 two largest futures exchanges in the United States are the Chicago Board of Trade (CBOT, www.cbot.com) and the Chicago Mercantile Exchange (CME, www.cme.com). The largest exchanges in Europe are the London International Financial Futures and Options Exchange (www.liffe.com), Eurex (www.eurexchange.com), and Euronext (www.euronext.com). Other large exchanges include Bolsa de Mercadorias y Futuros (www.bmf.com.br) in São Paulo, the Tokyo International Financial Futures Exchange (www.tiffe.or.jp), the Singapore International Monetary Exchange (www.simex.com.sg), and the Sydney Futures Exchange (www.sfe.com.au). For a more complete list, see the table at the end of this book.

We examine how a futures contract comes into existence by considering the corn futures contract traded on the Chicago Board of Trade (CBOT). On March 5 an investor 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 pass these instructions on to a trader on the floor of the CBOT. The broker would request a long position in one contract because each corn contract on the CBOT is for the delivery of exactly 5,000 bushels. At about the same time, another investor in Kansas might

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 trade on the Chicago Mercantile Exchange 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 go long (not short) 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 dispatched 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!

instruct a broker to sell 5,000 bushels of corn for July delivery. This broker would then pass instructions to short one contract to a trader on the floor of the CBOT. The two floor traders would meet, agree on a price to be paid for the corn in July, and the deal would be done.

The investor in New York who agreed to buy has a *long futures position* in one contract; the investor in Kansas who agreed to sell has a *short futures position* in one contract. The price agreed to on the floor of the exchange is the current *futures price* for July corn. We will suppose the price is 170 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 type of trade from 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 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 April 20. In each case, the investor's total gain or loss is determined by the change in the futures price between March 5 and April 20.

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.[1]

2.2 THE SPECIFICATION OF A FUTURES CONTRACT

The major exchanges that trade futures contracts are listed at the end of this book. 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 New York Cotton Exchange has specified the asset in its orange juice futures contract as

> US Grade A, with Brix value of not less than 57 degrees, having a Brix value to acid ratio of not less than 13 to 1 nor more than 19 to 1, with factors of color and flavor each scoring 37 points or higher and 19 for defects, with a minimum score 94.

The Chicago Mercantile Exchange in its random-length lumber futures contract has specified that

> Each delivery unit shall consist of nominal 2×4s of random lengths from 8 feet to 20 feet, grade-stamped Construction and Standard, Standard and Better, or #1 and #2;

[1] As mentioned in Chapter 1, the spot price is the price for almost immediate delivery.

> however, in no case may the quantity of Standard grade or #2 exceed 50%. Each delivery unit shall be manufactured in California, Idaho, Montana, Nevada, Oregon, Washington, Wyoming, or Alberta or British Columbia, Canada, and contain lumber produced from grade-stamped Alpine fir, Englemann spruce, hem-fir, lodgepole pine, and/or spruce pine fir.

For some commodities a range of grades can be delivered, but the price received depends on the grade chosen. For example, in the Chicago Board of Trade 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.

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 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 on the Chicago Board of Trade, 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's Mini Nasdaq 100 contract is on 20 times the Nasdaq 100 index, whereas the regular contract is on 100 times the index.

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 Chicago Mercantile Exchange's random-length lumber contract, the delivery location is specified as

> On track and shall either be unitized in double-door boxcars or, at no additional cost to the buyer, each unit shall be individually paper-wrapped and loaded on flatcars. Par delivery of hem-fir in California, Idaho, Montana, Nevada, Oregon, and Washington, and in the province of British Columbia.

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. For example, in the case of the corn futures contract traded by the Chicago Board of Trade, delivery can be made at Chicago, Burns Harbor, Toledo, or St. Louis. However, deliveries at Toledo and St. Louis are made at a discount of 4 cents per bushel from the Chicago contract price.

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 on the Chicago Board of Trade 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 futures price is quoted in a way that is convenient and easy to understand. For example, crude oil futures prices on the New York Mercantile Exchange are quoted in dollars per barrel to two decimal places (i.e., to the nearest cent). Treasury bond and Treasury note futures prices on the Chicago Board of Trade are quoted in dollars and thirty-seconds of a dollar. The minimum price movement that can occur in trading is consistent with the way in which the price is quoted. Thus, it is $0.01 per barrel for the oil futures and one thirty-second of a dollar for the Treasury bond and Treasury note futures.

Price Limits and Position Limits

For most contracts, daily price movement limits are specified by the exchange. If the price moves down 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 the 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. Short a futures contract
2. Buy the asset
3. Make delivery

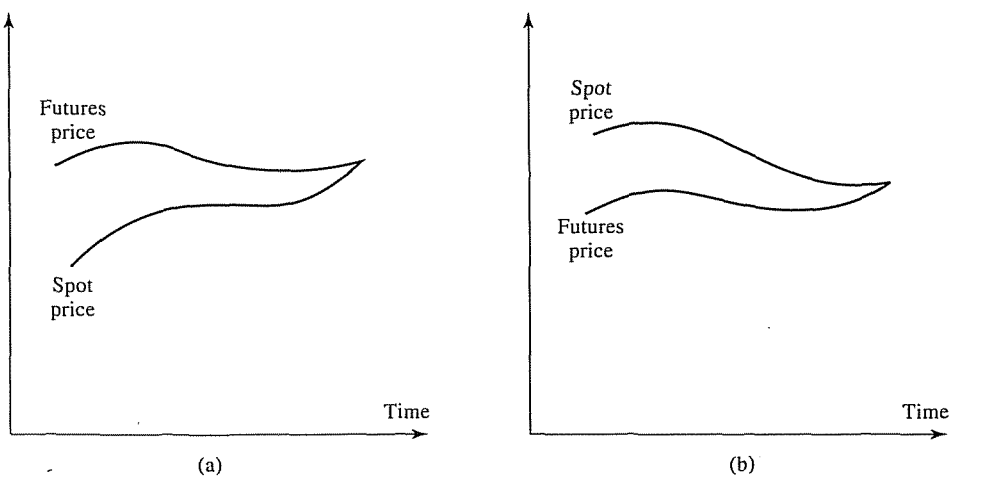
These steps are certain to lead to a profit equal to the amount by which the futures price exceeds the spot price. As traders exploit this arbitrage opportunity, the futures price will fall. Suppose next that the futures price is below the spot price during the delivery period. Companies interested in 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.

2.4 DAILY SETTLEMENT AND 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

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.



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.

The Operation of Margins

To illustrate how margins work, we consider an investor who contacts his or her broker on Thursday, June 5, to buy two December gold futures contracts on the New York Commodity Exchange (COMEX). We suppose that the current futures price is $400 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 $2,000 per contract, or $4,000 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 *marking to market* the account.

Suppose, for example, that by the end of June 5 the futures price has dropped from $400 to $397. The investor has a loss of $600 (= 200 × $3), because the 200 ounces of December gold, which the investor contracted to buy at $400, can now be sold for only $397. The balance in the margin account would therefore be reduced by $600 to $3,400. Similarly, if the price of December gold rose to $403 by the end of the first day, the balance in the margin account would be increased by $600 to $4,600. A trade is first marked to market at the close of the day on which it takes place. It is then marked to market at the close of trading on each subsequent day.

Note that marking to market 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 $600, the investor's broker has to pay the exchange $600 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 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 by selling the contract. 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 for the purpose of the illustration to be $1,500 per contract, or $3,000 in total. On June 13 the balance in the margin account falls $340 below the maintenance margin level. This drop triggers a margin call from the broker for an additional $1,340. Table 2.1 assumes that the investor does in fact provide this margin by the close of trading on June 16. On June 19 the balance in the margin account again falls below the maintenance

Table 2.1 Operation of margins for a long position in two gold futures contracts. The initial margin is $2,000 per contract, or $4,000 in total, and the maintenance margin is $1,500 per contract, or $3,000 in total. The contract is entered into on June 5 at $400 and closed out on June 26 at $392.30. The numbers in the second column, except the first and the last, represent the futures prices at the close of trading.

Day	*Futures price* ($)	*Daily gain (loss)* ($)	*Cumulative gain (loss)* ($)	*Margin account balance* ($)	*Margin call* ($)
	400.00			4,000	
June 5	397.00	(600)	(600)	3,400	
June 6	396.10	(180)	(780)	3,220	
June 9	398.20	420	(360)	3,640	
June 10	397.10	(220)	(580)	3,420	
June 11	396.70	(80)	(660)	3,340	
June 12	395.40	(260)	(920)	3,080	
June 13	393.30	(420)	(1,340)	2,660	1,340
June 16	393.60	60	(1,280)	4,060	
June 17	391.80	(360)	(1,640)	3,700	
June 18	392.70	180	(1,460)	3,880	
June 19	387.00	(1,140)	(2,600)	2,740	1,260
June 20	387.00	0	(2,600)	4,000	
June 23	388.10	220	(2,380)	4,220	
June 24	388.70	120	(2,260)	4,340	
June 25	391.00	460	(1,800)	4,800	
June 26	392.30	260	(1,540)	5,060	

margin level, and a margin call for $1,260 is sent out. The investor provides this margin by the close of trading on June 20. On June 26 the investor decides to close out the position by selling two contracts. The futures price on that day is $392.30, and the investor has a cumulative loss of $1,540. Note that the investor has excess margin on June 16, 23, 24, and 25. Table 2.1 assumes that the excess is not withdrawn.

Further Details

Many brokers allow an investor to earn 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 sometimes 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.

The effect of the marking to market is that a futures contract is settled daily rather than all at the end of its life. 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 takes a long position in a contract on an asset for one maturity month and 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 Clearinghouse and Clearing Margins

The *exchange clearinghouse* is an adjunct of the exchange and acts as an intermediary in futures transactions. It guarantees the performance of the parties to each transaction. The clearinghouse has a number of members, who must post funds with the exchange. Brokers who are not members themselves must channel their business through a member. The main task of the clearinghouse 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, a clearinghouse member is required to maintain a margin account with the clearinghouse. This is known as a *clearing margin*. The margin accounts for clearinghouse 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 clearinghouse 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 clearinghouse member may have to add funds to its margin account at the end of the day. Alternatively, it may find it can remove funds from the account at this time. Brokers who are not clearinghouse members must maintain a margin account with a clearinghouse member.

In determining clearing margins, the exchange clearinghouse calculates the number of contracts outstanding on either a gross or a net basis. The *gross basis* simply adds

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 was highly leveraged and unable to make the payments required under the collateralization agreements. The result was that positions had to be closed out and there was a total loss of 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 become closer to each other.

the total of all long positions entered into by clients to the total of all the short positions entered into by clients. The net basis allows these to be offset against each other. Suppose a clearinghouse 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 traders do not walk away from their commitments. Overall the system has been very successful. Investors entering into contracts at major exchanges have always had their contracts honored. Futures exchanges were tested on October 19, 1987, when the S&P 500 index declined by over 20% and investors with long positions in S&P futures found they had negative margin balances. Some of the investors walked away from their positions (even though they were legally obliged to make good on their contracts). 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, everyone who had a short futures position on the S&P 500 got paid off.

Collateralization in 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 is now imitating the margining system adopted by exchanges with a procedure known as *collateralization*.

Consider two participants in the over-the-counter market, company A and company B, with an outstanding over-the-counter contract. They could enter into a collateralization agreement where they value the contract each day using a pre-agreed valuation methodology. If from one day to the next the value of the contract to company A increases, company B is required to pay collateral equal to this increase to company A. Similarly, if the value of the contract to company A decreases, company A is required to pay collateral equal to the decrease to company B.

Collateralization significantly reduces the credit risk in over-the-counter contracts and is discussed further in Chapter 20. Collateralization agreements were used by a hedge fund, Long-Term Capital Management (LTCM), in the 1990s. They allowed LTCM to be highly leveraged. The contracts did provide credit risk protection, but as described in Business Snapshot 2.2 the high leverage left the hedge fund vulnerable to other risks.

2.5 NEWSPAPER QUOTES

Many newspapers carry futures prices. Table 2.2 shows the prices for commodities as they appeared in the *Wall Street Journal* of Thursday, February 5, 2004. The prices refer to the trading that took place on the previous day (i.e., Wednesday, February 4, 2004). The prices for index futures, currency futures, 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 corn, traded on the Chicago Board of Trade. The contract size is 5,000 bushels, and the price is quoted in cents per bushel. The months in which particular contracts are traded are shown in the first column. Corn contracts with maturities in March 2004, May 2004, July 2004, September 2004, December 2004, March 2005, and December 2005 were traded on February 4, 2004.

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 opening bell. For March 2004 corn on February 4, 2004, the opening price was 273.25 cents per bushel and, during the day, the price traded between 269.25 and 274.75 cents.

Table 2.2 Commodity futures quotes from the *Wall Street Journal*, February 5, 2004. (Columns show month, open, high, low, settle, change, lifetime high, lifetime low, and open interest, respectively.)

Exchange Abbreviations

For commodity futures and futures options

CBT-Chicago Board of Trade;
CME-Chicago Mercantile Exchange;
CSCE-Coffee, Sugar & Cocoa Exchange, New York;
CMX-COMEX (Div. of New York Mercantile Exchange);
EUREX-*European Exchange;*
FINEX-Financial Exchange (Div. of New York Cotton Exchange);
IPE-International Petroleum Exchange;
KC-Kansas City Board of Trade;
LIFFE-London International Financial Futures Exchange;
MATIF-Marche a Terme International de France;
ME-Montreal Exchange;
MPLS-Minneapolis Grain Exchange;
NQLX-NQLX (unit of Euronext.liffe)
NYCE-New York Cotton Exchange;
NYFE-New York Futures Exchange (Sub. of New York Cotton Exchange);
NYM-New York Mercantile Exchange;
ONE-OneChicago
SFE-Sydney Futures Exchange;
SGX-Singapore Exchange Ltd.;

Futures prices reflect day and overnight trading
Open interest reflects previous day's trading

Wednesday, February 4, 2004

Grain and Oilseed Futures

	OPEN	HIGH	LOW	SETTLE	CHG	LIFETIME HIGH	LIFETIME LOW	OPEN INT
Corn (CBT)-5,000 bu.; cents per bu.								
Mar	273.25	274.75	269.25	270.25	-2.75	281.50	219.00	292,145
May	278.00	279.75	274.00	275.25	-2.75	285.75	224.50	130,369
July	280.50	282.50	277.00	278.25	-2.25	288.50	227.75	79,647
Sept	274.50	276.00	272.50	272.50	-2.75	283.00	229.75	14,330
Dec	270.75	273.00	268.50	270.00	-.75	278.75	232.50	105,132
Mr05	274.25	276.00	272.25	273.50	-1.00	281.50	239.00	7,662
Dec	252.50	252.75	252.50	252.75	-.25	258.00	235.00	1,364
Est vol 54,315; vol Tue 81,306; open int 632,256, +1,555.								
Oats (CBT)-5,000 bu.; cents per bu.								
Mar	156.25	156.25	153.00	153.00	-3.00	164.75	131.00	4,361
May	158.50	158.50	155.75	155.75	-3.25	163.75	135.00	1,403
Est vol 543; vol Tue 1,134; open int 6,487, +277.								
Soybeans (CBT)-5,000 bu.; cents per bu.								
Mar	803.00	813.00	802.00	805.75	3.25	855.00	508.00	110,983
May	805.00	811.50	804.00	805.75	1.25	853.50	515.50	83,539
July	*795.50*	*799.50*	*791.50*	*792.00*	*-3.00*	*842.00*	*520.00*	*37,181*
Aug	765.50	770.00	760.00	760.50	-5.25	804.00	521.00	8,682
Sept	714.00	714.00	705.00	706.50	-5.50	748.00	528.00	4,033
Nov	643.50	646.50	635.00	636.50	-8.25	678.00	483.00	22,489
Ja05	643.00	643.00	638.00	638.00	-7.00	678.00	573.00	440
Est vol 51,149; vol Tue 69,055; open int 267,713, -1,819.								
Soybean Meal (CBT)-100 tons; $ per ton.								
Mar	246.80	249.80	246.50	247.00	.20	268.80	152.50	46,742
May	247.00	249.80	246.40	246.50	-.40	268.20	153.00	59,488
July	243.40	245.50	242.30	242.40	-1.00	263.20	152.50	32,077
Aug	*234.80*	*235.50*	*232.80*	*233.00*	*-1.10*	*251.20*	*154.00*	*11,892*
Sept	221.00	222.00	218.80	219.30	-.90	234.50	154.00	9,574
Oct	192.50	192.50	189.00	190.00	-1.40	206.00	150.50	7,015
Dec	189.00	189.00	185.50	185.60	-2.60	202.50	150.00	15,868
Ja05	188.00	188.00	185.50	185.80	-2.40	203.00	161.50	882
Est vol 20,000; vol Tue 33,272; open int 184,147, -2,396.								
Soybean Oil (CBT)-60,000 lbs.; cents per lb.								
Mar	29.86	30.13	29.75	29.86	...	30.37	19.00	70,068
May	29.75	30.02	29.66	29.76	.04	30.19	19.01	64,391
July	29.80	29.80	29.40	29.45	-.02	29.87	19.01	41,093
Aug	*29.08*	*29.15*	*28.85*	*28.90*	*-.05*	*29.20*	*19.05*	*5,103*
Sept	28.25	28.25	27.95	28.00	-.02	28.35	19.01	6,754
Oct	26.90	27.00	26.80	26.90	-.15	27.10	19.00	5,429
Dec	25.90	25.90	25.75	25.78	-.19	26.30	18.98	10,994
Est vol 17,571; vol Tue 33,871; open int 204,766, +2,177.								
Rough Rice (CBT)-2,000 cwt.; cents per cwt.								
Mar	776.00	784.50	770.00	773.00	-1.00	925.00	680.00	5,418
July	816.00	816.00	809.00	809.00	-1.00	939.00	761.00	541
Est vol 409; vol Tue 973; open int 7,275, -63.								
Wheat (CBT)-5,000 bu.; cents per bu.								
Mar	380.50	382.00	375.25	376.00	-4.50	421.50	301.50	75,392
May	386.75	387.00	381.00	382.50	-4.25	413.00	290.00	28,178
July	381.00	381.50	377.00	377.25	-4.25	404.00	298.00	25,753
Sept	382.00	383.50	381.00	381.50	-3.50	402.00	326.00	1,803
Dec	391.50	392.00	388.50	390.50	-3.50	410.00	330.00	3,219
Est vol 18,516; vol Tue 24,710; open int 134,517, +36.								
Wheat (KC)-5,000 bu.; cents per bu.								
Mar	386.00	387.50	380.00	380.50	-7.00	416.00	314.00	35,068
May	385.75	387.00	379.00	380.50	-6.75	412.00	315.00	14,006
July	383.50	384.00	380.00	380.50	-4.75	408.00	313.00	11,690
Sept	384.50	386.00	383.50	386.00	-2.00	405.00	330.50	1,938
Dec	392.50	393.50	390.00	390.00	-5.50	408.50	341.00	1,273
Est vol 19,427; vol Tue 10,017; open int 63,983, -463.								
Wheat (MPLS)-5,000 bu.; cents per bu.								
Mar	412.00	413.25	409.00	411.00	-2.50	423.75	343.75	13,938
May	407.00	407.25	401.50	402.25	-4.75	420.00	349.50	7,993
July	400.00	400.00	395.00	395.00	-5.50	411.00	352.00	4,185
Sept	396.50	396.50	391.50	391.50	-5.50	403.00	346.00	4,898
Dec	400.00	401.00	395.75	396.00	-5.00	408.00	355.00	1,037
Est vol 7,695; vol Tue 6,203; open int 32,066, -868.								

Livestock Futures

Cattle-Feeder (CME)-50,000 lbs.; cents per lb.								
Mar	83.70	83.80	82.22	82.22	-1.50	97.45	77.50	5,192
Apr	85.30	85.40	83.92	83.92	-1.50	94.90	78.30	2,260
May	85.85	85.85	84.35	84.35	-1.50	93.90	79.10	3,739
Aug	88.10	88.20	86.77	86.77	-1.50	93.25	81.60	2,316
Sept	87.75	87.75	87.00	87.00	-1.50	92.00	81.70	297
Oct	88.25	88.25	87.00	87.00	-1.50	92.00	81.95	317
Est vol 1,472; vol Tue 1,739; open int 14,199, +22.								
Cattle-Live (CME)-40,000 lbs.; cents per lb.								
Feb	76.30	76.45	74.82	74.82	-1.50	94.95	71.00	18,526
Apr	72.87	73.05	71.37	71.37	-1.50	85.55	68.60	42,771
June	69.95	70.15	68.42	68.42	-1.50	78.75	66.50	15,578
Aug	72.45	72.55	70.95	70.95	-1.50	77.20	68.00	8,444
Oct	75.50	75.55	74.02	74.20	-1.32	78.80	69.50	10,518
Dec	77.07	77.15	75.65	76.12	-1.02	78.90	72.00	3,520
Est vol 16,156; vol Tue 10,727; open int 100,345, +316.								
Hogs-Lean (CME)-40,000 lbs.; cents per lb.								
Feb	59.80	59.97	58.97	59.42	.50	63.00	50.75	5,560
Apr	59.67	60.00	58.70	58.87	-.47	62.40	53.55	28,654
May	60.55	60.85	60.30	60.65	-.05	63.90	55.90	1,621
June	65.00	65.10	64.05	64.60	-.15	67.10	58.40	8,907
July	61.70	61.80	61.25	61.47	-.02	63.85	56.90	2,289
Aug	59.70	59.80	59.25	59.65	.10	61.37	55.00	1,521
Oct	52.50	52.85	52.25	52.25	-.35	54.65	49.00	919
Dec	52.40	53.15	52.25	52.37	-.12	53.97	49.00	522
Est vol 10,289; vol Tue 8,924; open int 50,055, -1,609.								
Pork Bellies (CME)-40,000 lbs.; cents per lb.								
Feb	86.30	87.67	86.30	87.30	1.17	93.40	76.40	831
Mar	87.30	88.25	87.30	88.02	1.30	93.15	76.90	879
May	89.05	89.50	88.75	89.50	1.67	94.15	79.40	385
Est vol 669; vol Tue 883; open int 2,270, -26.								

Food and Fiber Futures

Lumber (CME)-110,000 bd. ft., $ per 1,000 bd. ft.								
Mar	334.20	344.50	334.00	344.50	10.00	365.00	256.20	2,408
May	336.60	346.60	336.60	346.60	10.00	357.50	263.10	686
July	337.90	344.00	335.10	343.20	6.80	354.90	282.00	233
Est vol 889; vol Tue 286; open int 3,368, -22.								
Milk (CME)-200,000 lbs., cents per lb.								
Feb	11.74	11.75	11.72	11.75	.05	11.90	10.95	2,554
Mar	12.20	12.26	12.20	12.20	.05	12.35	11.05	2,525
Apr	12.65	12.75	12.60	12.73	.13	12.75	11.00	1,988
May	12.88	13.00	12.87	12.95	.13	13.00	11.00	1,948
June	13.13	13.26	13.12	13.26	.16	13.32	11.41	1,761
July	13.74	13.95	13.72	13.86	.12	13.95	11.60	1,676
Aug	14.18	14.25	14.13	14.20	.02	14.28	11.65	1,723
Sept	14.55	14.75	14.55	14.65	.05	14.75	12.10	1,900
Oct	13.94	14.15	13.89	14.05	.11	14.15	11.89	1,513
Nov	12.95	13.20	12.95	13.20	.25	13.30	11.39	1,169
Dec	12.40	12.45	12.40	12.45	.05	12.50	11.30	809
Est vol 1,437; vol Tue 842; open int 19,736, +289.								

	OPEN	HIGH	LOW	SETTLE	CHG	LIFETIME HIGH	LIFETIME LOW	OPEN INT
Cocoa (CSCE)-10 metric tons; $ per ton.								
Mar	1,606	1,615	1,578	1,581	–19	2,358	1,250	22,360
May	1,596	1,599	1,565	1,569	–21	2,265	1,345	13,766
July	1,595	1,596	1,572	1,564	–23	2,307	1,350	12,922
Sept	1,590	1,590	1,562	1,563	–24	2,402	1,370	8,710
Est vol 9,057; vol Tue 9,675; open int 87,295, –1,218.								
Coffee (CSCE)-37,500 lbs.; cents per lb.								
Mar	73.75	74.00	71.60	72.60	–2.05	83.00	59.65	59,048
May	75.60	75.80	73.70	74.65	–1.95	82.00	61.75	26,054
July	77.00	77.70	75.70	76.45	–1.95	82.50	63.90	8,737
Sept	78.40	79.20	77.40	78.15	–1.90	83.45	65.75	7,837
Dec	80.15	81.25	80.15	80.75	–1.90	85.95	68.50	4,577
Mr05	83.40	83.70	83.40	83.30	–1.85	87.90	71.00	2,948
Est vol 32,220; vol Tue 15,761; open int 109,783, +1,170.								
Sugar-World (CSCE)-112,000 lbs.; cents per lb.								
Mar	5.74	5.77	5.66	5.68	–.07	7.65	5.50	131,494
May	5.94	5.97	5.87	5.88	–.07	7.32	5.54	50,135
July	5.97	6.00	5.92	5.93	–.06	6.95	5.50	37,213
Oct	6.09	6.10	6.02	6.03	–.06	6.88	5.55	25,822
Mr05	6.33	6.33	6.27	6.28	–.04	6.82	6.24	11,411
May	6.32	6.33	6.30	6.30	–.03	6.57	6.20	4,813
July	6.28	6.29	6.28	6.25	–.03	6.42	6.15	2,901
Est vol 23,839; vol Tue 32,525; open int 265,575, –1,048.								
Sugar-Domestic (CSCE)-112,000 lbs.; cents per lb.								
Mar	20.35	20.40	20.35	20.40	.04	22.02	20.20	884
May	20.35	20.35	20.35	20.35	...	22.07	20.15	3,835
July	20.50	20.50	20.50	20.50	...	22.10	20.25	3,280
Sept	20.74	20.74	20.74	20.74	–.01	22.07	20.63	3,087
Nov	21.05	21.05	21.05	21.05	...	21.70	20.94	855
Ja05	20.80	20.80	20.80	20.80	...	21.40	20.80	285
Est vol 43; vol Tue 203; open int 12,510, –112.								
Cotton (NYCE)-50,000 lbs.; cents per lb.								
Mar	69.10	69.90	68.70	69.25	.35	86.00	45.60	43,633
May	71.20	71.95	70.75	71.27	.44	86.00	51.50	27,184
July	72.35	73.00	71.80	72.30	.35	85.50	56.75	8,924
Dec	68.00	68.25	67.50	67.75	.05	71.00	59.00	6,330
Est vol 12,611; vol Tue 21,022; open int 88,074, +239.								
Orange Juice (NYCE)-15,000 lbs.; cents per lb.								
Mar	61.20	62.00	60.80	61.65	.25	103.50	60.60	25,803
May	64.50	64.70	64.00	64.45	.25	105.00	63.50	7,488
July	67.20	67.30	66.50	67.05	.35	106.00	66.40	1,518
Sept	69.40	70.00	69.40	69.40	.20	86.80	69.25	774
Nov	71.30	71.30	71.30	71.90	–.10	91.50	71.30	491
Est vol 1,846; vol Tue 1,259; open int 36,251, –123.								

Metal Futures

Copper-High (CMX)-25,000 lbs.; cents per lb.								
Feb	116.90	117.30	116.90	117.35	0.60	117.30	67.20	1,033
Mar	116.85	117.55	116.50	117.45	0.60	117.55	69.75	65,863
Apr	116.55	116.90	116.55	117.10	0.60	116.90	71.95	941
May	116.05	116.70	115.95	116.55	0.45	116.70	70.90	8,263
June	116.00	116.15	115.75	115.95	0.40	116.15	73.50	724
July	115.00	115.45	115.00	115.30	0.35	115.45	70.90	6,549
Aug	114.30	114.70	114.30	114.70	0.40	114.70	73.65	486
Sept	113.90	114.00	113.90	114.05	0.40	114.00	70.95	2,211
Oct	113.25	113.25	113.25	113.45	0.40	113.25	74.00	388
Nov	112.55	112.70	112.45	112.85	0.40	112.70	79.00	287
Dec	111.85	112.35	111.60	112.20	0.35	112.35	74.20	4,135
Mr05	110.55	110.55	110.50	110.40	0.25	110.55	74.40	322
Est vol 11,000; vol Tue 8,170; open int 91,868, –170.								
Gold (CMX)-100 troy oz.; $ per troy oz.								
Feb	399.80	401.30	398.50	401.00	1.80	431.50	322.00	5,090
Apr	400.70	401.80	399.40	401.70	1.80	432.30	320.00	143,464
June	401.40	403.00	400.50	402.70	1.80	432.00	287.00	29,868
Aug	403.10	403.10	402.00	403.70	1.80	431.30	324.70	8,621
Dec	404.10	405.50	403.00	405.50	1.70	434.50	290.00	22,312
Est vol 40,000; vol Tue 40,608; open int 236,512, –4,897.								
Platinum (NYM)-50 troy oz.; $ per troy oz.								
Apr	824.00	824.00	812.00	820.60	–5.70	868.00	677.00	6,816
July	...	...	...	810.60	–5.70	852.00	801.00	292
Est vol 602; vol Tue 808; open int 7,126, –95.								
Silver (CMX)-5,000 troy oz.; cnts per troy oz.								
Feb	611.5	611.5	611.5	614.5	2.4	611.5	611.5	240
Mar	613.0	618.5	607.0	614.8	2.5	679.5	437.0	78,208
May	614.5	620.0	608.5	616.2	2.6	681.0	445.0	7,153
July	616.5	621.0	611.0	617.4	2.6	673.0	436.0	5,063
Dec	618.5	623.0	613.0	619.9	2.6	677.0	440.0	12,458
Dc05	627.0	627.0	627.0	624.6	3.9	675.0	436.0	1,564
Est vol 16,000; vol Tue 15,059; open int 107,432, –482.								

Petroleum Futures

Crude Oil, Light Sweet (NYM)-1,000 bbls.; $ per bbl.								
Mar	34.09	34.45	32.95	33.10	–1.00	35.25	20.35	196,160
Apr	32.82	33.25	31.85	31.99	–0.83	34.50	20.35	91,932
May	32.11	32.20	31.25	31.32	–0.72	33.85	20.35	42,864
June	31.55	31.65	30.80	30.84	–0.63	33.25	20.53	39,700
July	31.00	31.10	30.40	30.37	–0.60	32.60	20.86	29,920
Aug	30.57	30.60	30.10	29.93	–0.58	32.15	20.84	19,040
Sept	30.21	30.21	29.65	29.58	–0.56	31.61	20.82	26,690
Oct	29.93	29.93	29.93	29.33	–0.54	31.20	23.75	17,830
Nov	29.59	29.70	29.59	29.11	–0.53	30.85	24.75	14,370
Dec	29.60	29.60	29.00	28.92	–0.52	30.69	16.35	51,129
Ja05	29.00	29.00	29.00	28.67	–0.50	30.33	23.25	15,606
Feb	28.75	28.75	28.75	28.48	–0.49	30.07	23.85	5,061
June	28.24	28.24	28.24	27.79	–0.45	29.05	22.40	10,556
Dec	27.42	27.52	27.20	27.03	–0.39	28.31	17.00	25,454
Dc06	26.77	26.77	26.60	26.38	–0.39	27.65	19.10	16,726
Dc07	26.45	26.50	26.40	26.18	–0.34	27.35	19.50	9,971
Dc08	26.50	26.50	26.50	26.18	–0.34	27.15	19.75	7,354
Est vol 225,976; vol Tue 219,163; open int 663,890, +1,691.								
Heating Oil No. 2 (NYM)-42,000 gal.; $ per gal.								
Mar	.9142	.9280	.8830	.8897	–.0245	1.0129	.6370	64,063
Apr	.8770	.8840	.8505	.8586	–.0166	.9417	.6275	22,296
May	.8436	.8436	.8200	.8251	–.0151	.8881	.6140	10,010
June	.8174	.8185	.7950	.8016	–.0136	.8581	.6354	11,337
July	.7800	.7910	.7800	.7896	–.0131	.8380	.6415	7,713
Aug	.7925	.7925	.7750	.7876	–.0126	.8373	.6455	5,437
Oct	.8050	.8050	.8050	.7986	–.0121	.8425	.6655	1,466
Nov	.8100	.8100	.8100	.8046	–.0121	.8480	.6820	1,548
Dec	.8175	.8175	.8100	.8106	–.0121	.8540	.6937	10,047
Est vol 66,129; vol Tue 49,216; open int 141,064, +3,503.								
Gasoline-NY Unleaded (NYM)-42,000 gal.; $ per gal.								
Mar	1.0015	1.0150	.9740	.9857	–.0158	1.0410	.7325	67,894
Apr	1.0475	1.0530	1.0190	1.0305	–.0124	1.0800	.7975	27,871
May	1.0310	1.0310	1.0130	1.0150	–.0119	1.0655	.8080	13,375
June	1.0050	1.0100	.9920	.9895	–.0109	1.0410	.8070	6,390
July	.9550	.9650	.9550	.9615	–.0104	1.0100	.9300	3,617
Sept	.9090	.9090	.9050	.8940	–.0089	.9380	.8530	5,260
Est vol 46,056; vol Tue 48,469; open int 131,831, +2,200.								
Natural Gas (NYM)-10,000 MMBtu.; $ per MMBtu								
Mar	5.670	5.790	5.560	5.654	.003	7.500	3.150	51,734
Apr	5.350	5.420	5.280	5.340	.015	6.010	2.970	23,196
May	5.180	5.270	5.180	5.210	.020	5.668	3.030	25,805
June	5.220	5.260	5.190	5.210	.020	5.612	3.010	19,336
July	5.230	5.274	5.200	5.235	.020	5.622	3.040	17,676
Aug	5.260	5.294	5.220	5.250	.020	5.624	3.120	13,402
Sept	5.220	5.265	5.180	5.218	.020	5.640	3.100	13,093
Oct	5.230	5.240	5.200	5.225	.017	5.580	3.100	14,742
Nov	5.430	5.460	5.400	5.423	.017	5.735	3.270	10,289
Dec	5.610	5.660	5.580	5.613	.015	5.912	3.460	12,860
Ja05	5.745	5.800	5.710	5.750	.015	6.027	3.520	9,971
Feb	5.710	5.720	5.680	5.710	.015	5.991	3.400	9,752
Mar	5.570	5.570	5.505	5.540	.020	5.740	3.640	8,955
May	4.880	4.880	4.880	4.900	.020	5.000	3.500	4,187
June	4.920	4.920	4.920	4.925	.020	5.020	3.530	4,518
July	4.950	4.950	4.950	4.961	.020	5.050	3.560	10,788
Aug	4.950	4.950	4.950	4.971	.020	5.065	3.230	5,319
Dec	5.290	5.290	5.290	5.311	.015	5.400	3.960	4,389
Est vol 46,926; vol Tue 45,710; open int 307,861, –1,771.								
Brent Crude (IPE)-1,000 net bbls.; $ per bbl.								
Mar	29.52	29.80	28.85	28.88	–0.62	32.10	23.00	81,701
Apr	29.28	29.53	28.62	28.66	–0.63	31.54	22.95	82,264
May	29.10	29.34	28.45	28.48	–0.66	31.18	21.97	22,069
June	28.88	29.07	28.25	28.29	–0.65	30.83	23.45	27,498
July	28.69	28.83	28.29	28.08	–0.65	30.55	23.65	10,450
Aug	28.10	28.51	28.10	27.87	–0.64	30.20	24.00	9,032
Sept	28.25	28.29	27.88	27.65	–0.64	29.77	24.40	11,307
Oct	27.94	28.08	27.94	27.45	–0.63	39.45	20.90	5,806
Nov	27.73	27.88	27.73	27.27	–0.61	38.85	24.15	5,352
Dec	27.65	27.70	27.17	27.10	–0.59	38.83	25.32	24,112
Ja05	27.44	27.45	27.35	26.88	–0.57	28.70	22.43	3,611
Dec	26.00	26.00	25.90	25.65	–0.34	26.90	21.91	20,253
Dc06	25.30	25.30	25.30	25.05	–0.29	26.05	24.10	3,400
Est vol 113,000; vol Tue 113,278; open int 321,427, –3,267.								

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 bell signaling the end of trading for the day. The fifth number is the change in the settlement price from the previous day. For the March 2004 corn futures contract, the settlement price was 270.25 cents on February 4, 2004, down 2.75 cents from February 3, 2004.

In the case of the March 2004 corn futures, an investor with a long position in one contract would find his or her margin account balance reduced by \$137.50 (= 5,000 × 2.75 cents) between February 3, 2004, and February 4, 2004. Similarly, an investor with a short position in one contract would find that the margin balance increased by \$137.50 between these two dates.

Lifetime Highs and Lows

The sixth and seventh numbers show the highest futures price and the lowest futures price achieved in the trading of the particular contract over its lifetime. The March 2004 corn contract had traded for well over a year on February 4, 2004. During this period the highest and lowest prices achieved were 281.50 cents and 219.00 cents.

Open Interest and Volume of Trading

The final column in Table 2.2 shows the *open interest* for each contract. This is the total number of contracts outstanding. The open interest is the number of long positions or, equivalently, the number of short positions. Because of the problems in compiling the data, the open-interest information is one trading day older than the price information. Thus, in the *Wall Street Journal* of February 5, 2004, the open interest is for the close of trading on February 3, 2004. For the March 2004 corn futures contract, the open interest was 292,145 contracts.

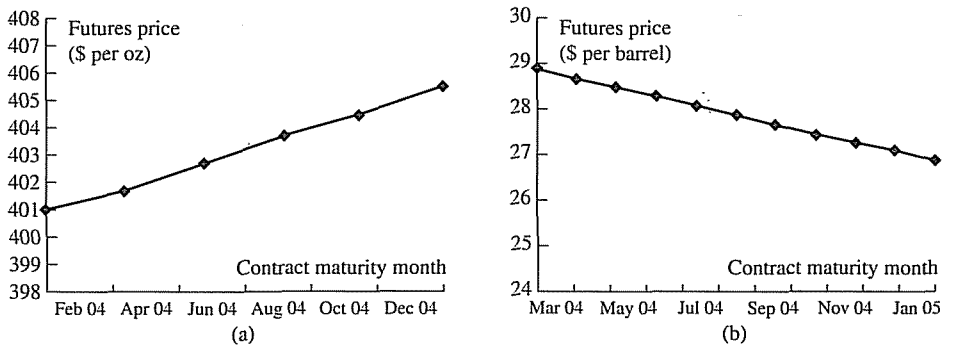
At the end of each section, Table 2.2 shows the estimated volume of trading in contracts of all maturities on February 4, 2004, and the actual volume of trading in these contracts on February 3, 2004. It also shows the total open interest for all contracts on February 3, 2004, and the change in this open interest from the previous trading day. For all corn futures contracts, the estimated trading volume was 54,315 contracts on February 4, 2004, and the actual trading volume was 81,306 contracts on February 3, 2004. The open interest for all corn futures contracts was 632,256 on February 3, 2004, up 1,555 from the previous trading day.

Sometimes the volume of trading in a day is greater than the open interest at the end of the day. This is indicative of a large number of day trades.

Patterns of Futures Prices

A number of different patterns of futures prices can be picked out from Table 2.2. Figure 2.2 shows the pattern of (settlement) futures prices for the gold contract trading on the New York Commodity Exchange and the Brent crude oil contract trading on the International Petroleum Exchange. The futures price of gold increases as the time to maturity increases. This is known as a normal market. By contrast, the futures price of crude oil is a decreasing function of maturity. This is known as an *inverted market*.

Figure 2.2 Settlement futures price as a function of time to maturity on February 4, 2004, for (a) gold and (b) Brent crude oil.



Other commodities show mixed patterns. For example, the futures price of heating oil first decreases, then increases with maturity.

2.6 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 clearinghouse. 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. In the case of financial futures, delivery is

usually made by wire transfer. For all contracts the price paid is usually based on the settlement price immediately preceding the date of the notice of intention to deliver. 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, 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 particular 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 trading on the Chicago Mercantile Exchange, all contracts are declared closed on the third Friday of the delivery month and the final settlement price is the opening price of the index on that day.

2.7 TYPES OF TRADERS AND TYPES OF ORDERS

There are two main types of traders executing trades: commission brokers and locals. *Commission brokers* 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 commission brokers, 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 take a long position, 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.

2.8 REGULATION

Futures markets in the United States are currently regulated federally by the Commodity Futures Trading Commission (CFTC; 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) 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. The NFA requires its members to pass an exam. 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), the Federal Reserve Board (www.federalreserve.gov), and the US Treasury Department (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".[2] 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] 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 $9 per ounce to $50 per ounce.

2.9 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 2004 it takes a long position in a March 2005 corn futures contract and closes out the position at the end of February 2005. Suppose that the futures prices are 250 cents per bushel when the contract is entered into, 270 cents per bushel at the end of 2004, 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 2004 and

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

in 2005. If the company is hedging the purchase of 5,000 bushels of corn in February 2005 so that the contract qualifies for hedge accounting, the entire gain of $1,500 is realized in 2005 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 2005, 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 2005. The 2004 accounts for the company are unaffected by the futures transaction.

In June 1998, the Financial Accounting Standards Board issued FASB Statement No. 133, Accounting for Derivative Instruments and Hedging Activities (FAS 133). 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.[3] 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 now 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.

[3] Previously the attraction of derivatives in some situations was that they were "off-balance-sheet" items.

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

The hedging transaction must be identified before the end of the day on which the taxpayer enters into the transaction. The asset being hedged must be identified within 35 days. 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 deduction from the hedged items.

2.10 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 1.6000 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?

Table 2.3 Comparison of forward and futures contracts.

Forward	*Futures*
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

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 1.8000 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 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 a difference in the way exchange rates are quoted in the two markets. Futures prices 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 0.7050 USD per CAD corresponds to a forward price quote of 1.4184 CAD per USD ($1.4184 = 1/0.7050$).

SUMMARY

A very high proportion of the futures contracts that are traded do not lead to the delivery of the underlying asset. They are closed out 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 clearinghouse member or must maintain a margin account with a clearinghouse member. Each clearinghouse member maintains a margin account with the exchange clearinghouse. The balance in the account is adjusted daily to reflect gains and losses on the business for which the clearinghouse 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 need not 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. *Futures Markets*. Upper Saddle River, NJ: Prentice Hall, 1989.

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.

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.

Warwick, B., F. J. Jones, and R. J. Teweles. *The Futures Game*. 3rd edn. New York: McGraw-Hill, 1998.

Questions and Problems (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 *commission broker*?

2.3. Suppose that you enter into a short futures contract to sell July silver for $5.20 per ounce on the New York Commodity Exchange. 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 2006 you take a long position in a contract on May 2007 crude oil futures. You close out your position in March 2007. The futures price (per barrel) is $18.30 when you enter into your contract, $20.50 when you close out your position, and $19.10 at the end of December 2006. One contract is for the delivery of 1,000 barrels. What is your total profit? When is it realized? How is it taxed if you are (a) a hedger and (b) a speculator? Assume that you have 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 clearinghouse 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. An investor enters into two long 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 than 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 clearinghouse 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 clearinghouse?

2.16. On July 1, 2006, a US company enters into a forward contract to buy 10 million GBP on January 1, 2007. On September 1, 2006, it enters into a forward contract to sell 10 million

GBP on January 1, 2007. Describe the profit or loss the company will make in dollars as a function of the forward exchange rates on July 1, 2006, and September 1, 2006.

2.17. The forward price on the Swiss franc for delivery in 45 days is quoted as 1.8204. The futures price for a contract that will be delivered in 45 days is 0.5479. 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. Identify the contracts with the highest open interest in Table 2.2. Consider each of the following sections separately: grains and oilseeds, livestock, food and fiber, metals, and petroleum.

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, 2006, you take a short position in an April 2007 live cattle futures contract. You close out your position on January 21, 2007. The futures price (per pound) is 61.20 cents when you enter into the contract, 58.30 cents when you close out your position, and 58.80 cents at the end of December 2006. One contract is for the delivery of 40,000 pounds of cattle. What is your total profit? How is it taxed if you are (a) a hedger and (b) a speculator?

2.24. A cattle farmer expects to have 120,000 pounds of live cattle to sell in 3 months. The live cattle futures contract on the Chicago Mercantile Exchange 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 now July 2005. 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 on the New York Commodity Exchange. There are delivery months every 2 months from August 2005 to December 2006. Each contract is for the delivery of 100 ounces. Discuss how the mining company might use futures markets for hedging.

Assignment Questions

2.26. A company enters into a short futures contract to sell 5,000 bushels of wheat for 250 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?

2.27. Suppose that there are no storage costs for corn and the interest rate for borrowing or lending is 5% per annum. How could you make money on February 4, 2004, by trading March 2004 and May 2004 contracts. Use Table 2.2.

2.28. 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.

2.29. The author's Web page (www.rotman.utoronto.ca/~hull/data) contains daily closing prices for the December 2001 crude oil futures contract and the December 2001 gold futures contract. (Both contracts are traded on NYMEX.) 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 maintenence margin level on a particular day has a negative balance 2 days later (i.e. 1 day after a margin call)? How high do they have to be for a 0.1% chance? Assume daily price changes are normally distributed with mean zero.

(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 and therefore an incentive to walk away. 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.