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# FUNCTIONING OF FUTURES AND OPTION MARKETS

In the last chapter, we defined the nature of futures and option contracts. In this chapter, we describe the nature of the markets in which they trade. In section one, the two types of futures and option markets are described—exchange-traded markets and over-the-counter markets. Section two contains a discussion of the elements of futures and option contract design. Trading procedures in futures and option markets are described in section three, and the role of the clearing house in exchange-traded markets is described in section four.

## 2.1 EXCHANGE MARKETS VERSUS OTC MARKETS

This book deals primarily with organized exchange markets in futures and option contracts, which are to be distinguished from over-the-counter (OTC) markets. In exchange markets, contracts are standardized, and a clearing house stands between the buyer and seller and guarantees contracts. The clearing house is the buyer to every seller of a contract and the seller to every buyer. Under this arrangement, secondary market trading is possible because a buyer of a contract who wishes to liquidate the position need not find the original seller of the contract but may negotiate a transaction with any individual. Organized exchange markets thus facilitate trading between strangers.

In OTC markets, contracts are tailored to the needs of the transacting parties, and no clearing house exists. As a result, a futures contract or an option contract is a contract between the two parties whose names are on the contract and who make their own arrangements for guaranteeing the contract's financial integrity.

Secondary market trading is very inefficient in OTC markets because a buyer who wishes to liquidate a position must seek an agreement with the original seller of the contract. The term “forward contract” is frequently used to designate OTC contracts that have the form of futures contracts except that they may lack standardization or the presence of a liquid secondary market.

OTC markets usually precede organized exchange markets in futures and options. For example, prior to the start of wheat futures trading in the late 1800s, forward contracts were used by grain elevator operators to purchase wheat from farmers. Prior to the inception of the Chicago Board Options Exchange in 1973, over-the-counter options on common stocks were arranged by put and call dealers.

Organized futures and option markets began in order to provide a means for temporarily hedging a position in the underlying commodity without giving up its control. In OTC markets, delivery is usually implied. The secondary market trading made possible by organized exchange markets allows participants to temporarily hedge their positions without making a commitment to relinquish control of the underlying commodity. Optimal transactions in the underlying commodity can then be arranged either for spot (immediate) delivery or for forward (delayed) delivery. Once the transaction in the underlying commodity is complete, the position in the futures or option market can be liquidated.

The recent growth in organized futures and option markets does not mean that OTC markets have declined in importance, however. Forward contracts in most tangible underlying commodities (such as wheat or oil) are frequently used. Such contracts are the means by which specific grades of the underlying commodity are sold to particular buyers of the commodity. In recent years, OTC market trading in derivative financial instruments has grown dramatically alongside organized markets in these instruments. This reflects the fact that OTC forward and option contracts can be tailored directly to the needs of a customer. Institutions create OTC forward or option contracts tailored to the needs of their retail customers and then use organized markets to offset their OTC market positions. For example, suppose a corporation needs Japanese yen on a particular future date, and the date does not correspond to the maturity of any available Japanese yen futures contract. In this case, the corporation is likely to go to a bank that is willing to design a forward contract to the corporation’s needs.

## **2.2 CONTRACT DESIGN**

Futures and options are contracts to do something at a later date. The obligation of the buyer and seller are defined in the contract. Only the price and number of contracts are negotiated at the time of transaction.

Two opposing forces influence contract design: standardization versus market depth. Market participants would prefer the commodity underlying a futures or option contract to be clearly and narrowly defined. However, a narrowly defined contract, while useful to certain participants, may fail to attract sufficient participants to provide a deep and liquid market. A deep and liquid market is desirable for two reasons: first, to permit secondary market trading “in size” to be carried

out with relatively little impact on price; and, second, to limit the possibility of corners or short squeezes.<sup>1</sup>

A corner or short squeeze arises when sellers of a futures or option contract cannot acquire the underlying commodity for delivery. If the commodity is narrowly defined, it is possible for someone to monopolize the supply of the commodity. If that individual also purchases futures or option contracts on the commodity, a corner results—the individual owns or has a claim on more of the commodity than is available. If the contract is broadly defined to allow delivery of various related underlying commodities, control of the deliverable supply is much more difficult, and corners and squeezes are much less likely. If a narrowly defined underlying commodity is in large supply, the futures and option contracts can be narrowly defined. However, if the supply of a single grade is not large enough or if a single delivery location is not convenient enough, futures and option contracts are broadly defined to allow delivery of several grades at several locations.

Most futures and option contracts must make provisions for the following features: (a) maturity months; (b) contract size; (c) method of contract settlement; (d) grade of deliverable commodity; (e) point of delivery; (f) time of settlement at maturity; and, in the case of options, (g) the number of exercise prices.

### **Maturity Months**

Too many maturity months reduce the depth and liquidity in any one month. Too few maturity months reduce the usefulness of a contract. How these conflicting objectives are balanced depends on the underlying commodity. For example, in wheat, five maturity months (March, May, July, September, December) are traded at any time, reflecting the harvesting and marketing cycles for wheat. In silver, sufficient volume exists to warrant the trading of ten different maturity months extending one and a half years into the future. In Eurodollar futures, twelve maturity months extending three years into the future are traded.

It is worth noting that the number of days until maturity of a particular futures contract is changing as the maturity date is approached. This is in contrast to various forward contracts, the prices of which are quoted in the newspaper. For example, the newspaper may quote the three-month forward price of silver or the three-month forward price of a currency. These quotes are for new contracts originated on that day. The secondary market for these contracts after they are originated is not very active, so price quotes of existing contracts do not appear in the newspaper.

### **Contract Size**

Contract sizes vary considerably and are chosen to meet the needs of the users of the contract. In many of the grains, the standard contract size is 5,000 bushels, or approximately \$15,000 at the current price of the commodities. Contract sizes are considerably larger in some of the financial futures. For example, futures on Treasury bills and Eurodollars have contract sizes of \$1 million.

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<sup>1</sup>For more analysis of contract design and the success and failure of futures contracts, see Black (1986), Carlton (1984), Johnston and McConnell (1989), and Stoll and Whaley (1985).

### **Method of Contract Settlement at Maturity**

Most futures and option contracts are settled by delivery at maturity. Should a contract be carried into the delivery month, certain rules and procedures govern delivery. With futures contracts, the seller of futures (the short) may make delivery of the underlying commodity during a time in the maturity month specified by exchange regulation. Delivery of tangible commodities may be made at any time during an extended period, such as two weeks, and usually takes the form of warehouse receipts giving claim to the commodity, which is stored at an approved location. Delivery of financial commodities is usually more narrowly defined, with delivery taking place through an approved bank. The buyer of futures (the long) is obligated to take delivery if called upon to do so. The assignment of delivery notices by the exchange takes various forms. In some markets, the oldest long is assigned the delivery notice. In other markets, delivery notices are assigned randomly. Futures contracts differ as to the flexibility remaining to the long after the receipt of a delivery notice. In some cases, usually in the tangible commodities, the long has the opportunity to pass the notice on to someone else and to liquidate the futures contract. The shorts usually have the greatest flexibility because they can choose the particular grade of underlying commodity that will be delivered as well as the exact timing of delivery.

With American-style call options, the buyer may request delivery—exercise the options—at any time during the option's life. The seller of the call is then obligated to make delivery. With European-style call options, delivery may be requested only on the expiration date. Options tend not to be written on underlying tangible commodities that may be difficult and cumbersome to deliver. Instead, options on such commodities are written on the futures contract on those commodities. Exercising a call option on corn, for example, is a request for the option seller to deliver the long futures position in corn. When the long futures position is received, the position may be held to maturity if delivery of the corn is desired. The exercise of a put option on corn is a request for the option seller to deliver a short futures position in corn. Options on many financial instruments, such as options on individual common stocks, call for delivery of the underlying financial instrument.

Certain futures and option contracts call for cash settlement rather than delivery at maturity. The buyer of a cash settled futures contract, holding the position until expiration, receives the difference between the final settlement price of the futures contract and the price at which the contract was purchased.<sup>2</sup> The final settlement price of the futures contract is the cash price of the underlying commodity. The seller of the futures contract receives a profit exactly opposite that received by the buyer. In the case of cash settlement call options, the exercise of a call option results not in the delivery of an underlying commodity, but rather in a profit equal to the difference between the price of the underlying commodity and the exercise price of the option.

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<sup>2</sup>Technically, this statement applies to forward contracts only. The futures contract holder has accumulated over the life of the contract an amount equal to the difference between the final settlement price and the price at which the futures was purchased. In the interest of clarity, we defer detailed discussion of the distinction between forward and futures contracts to Chapter 3.

Cash settlement is particularly useful when the underlying commodity is difficult to deliver. In U.S. markets, stock index futures and options are cash settled because it is difficult to deliver a large portfolio of many different common stocks. Municipal bond futures and futures on the consumer price index are also cash settled, because, in these cases, the underlying commodity is impossible to deliver. In the case of municipal bond futures, the price of the underlying commodity is actually an average of dealer quotations in municipal bonds.

### **Grade of Underlying Commodity**

When the underlying commodity has differing characteristics, the futures or option contract specifies the standard grade of the deliverable commodity as well as the other grades that may be delivered. For example, the Chicago Board of Trade (CBT) wheat contract calls for the delivery of No. 2 soft red wheat, however certain other grades are also deliverable. Another example is the CBT's T-bond futures contract. Nominally, the contract calls for the delivery of an eight-percent coupon bond with a maturity of at least fifteen years. However, T-bonds with other coupons and with maturities in excess of fifteen years are also acceptable for delivery.

The choice for a particular grade of an underlying commodity to be delivered against a futures contract is left to the short, and the short naturally chooses the "cheapest to deliver." For example, if both soft red wheat and hard red winter wheat are deliverable against the wheat futures contract, but hard red winter wheat is selling in the marketplace at a lower price than soft red wheat, the person with a short position will choose to deliver hard red winter wheat because it is the cheapest to deliver. Indeed, the futures price at maturity reflects the price of the cheapest to deliver grade of wheat, not necessarily the grade specified as standard in the futures contract. In T-bond futures, it is sometimes desirable to deliver a low-coupon, long-maturity bond and at other times desirable to deliver a high-coupon, short-maturity bond. The eight-percent coupon bond specified as standard in the contract is usually not the bond being priced by the futures contract.

The cheapest-to-deliver commodity may change during the futures contract life. The exchange specifies the price relation between the deliverable grades prior to the start of the contract. As market conditions change, some grades go to a premium or discount relative to the standard grade.

### **Point of Delivery**

An important feature of futures contracts on tangible commodities is the number and the location of delivery points. Transportation of tangible commodities to the delivery location may be costly. As a result, an increase in the number of delivery locations benefits the shorts who are obligated to deliver. To see this, suppose a wheat futures contract calls for delivery only in approved warehouses in Chicago. If wheat is in relatively short supply in Chicago, it is possible for someone to buy up most of the remaining supply while at the same time buying wheat futures contracts. Such an individual would have engineered a corner if the market did not have sufficient time to ship wheat to the Chicago delivery location. As a result, it

is sometimes desirable to specify several delivery locations in a contract, thereby making it difficult to corner the available supplies at all the delivery points.<sup>3</sup>

### **Time of Contract Settlement at Maturity**

Most futures contracts on tangible commodities and certain financial futures and option contracts allow a period of time in the maturity month during which delivery may be made. In the case of wheat futures, for example, delivery may be made at any time in the maturity month, at the option of the seller. In the case of futures on tangible commodities, the seller usually has the option of when to deliver, what grade to deliver, and where to deliver it. These features provide protection for the seller against the danger that someone may corner the available supply of the underlying commodity which must be delivered. When delivery is easy and the danger of a corner of the underlying deliverable supply is small, as in many financial instruments, the time of delivery and other features, such as grade and location, are more narrowly prescribed.

### **Exercise Price**

In the case of options, a feature is required that is not required in futures contracts—namely, the number of exercise prices which should be available. It would be possible, for example, to have only one exercise price for each option maturity. This is not done because the usefulness of an option is greatest when the exercise price is close to the price of the underlying commodity. As a result, additional options with new exercise prices are created whenever the underlying commodity's price moves by a prespecified amount. For example, a stock selling at \$40 might have an option with an exercise price of \$40. If the stock price increases to \$45, a new option with an exercise price of \$45 would be initiated. The \$5 increment at which a new option with a new exercise price is initiated is determined by the exchange.<sup>4</sup> All the options on a particular underlying commodity with the same maturity are called an *option series*. The number of options in an option series is determined by the price volatility of the underlying commodity and the price increment at which additional exercise prices will be set. If the price increment is small, many options, each with relatively little liquidity, will be created. If the price increment is large, few options will be created.

## **2.3 TRADING PROCEDURES**

Public customers wishing to trade futures or options open an account with a brokerage firm. In the futures industry, a brokerage firm is sometimes called a *futures commission merchant* (FCM). Futures and futures option contracts are traded in a

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<sup>3</sup> A recent book by Pirrong, Haddock, and Kormendi (1991) provides a detailed analysis of delivery terms for agricultural commodities.

<sup>4</sup> Stock option exercise prices at \$25 or above have \$5 increments. Below \$25, the increments are \$2.50.

commodity account, and options written directly on financial instruments are traded in securities accounts. These two types of accounts are subject to Commodity Futures Trading Commission (CFTC) oversight and Securities and Exchange Commission (SEC) oversight, respectively.<sup>5</sup>

### **Types of Orders**

In trading futures and options, as with other securities, investors can place a variety of orders. A *market order* instructs the broker to trade at the best price currently available. A *limit order* instructs the broker to buy or sell at a specific price. Naturally, the price given for a limit order to buy is below the current market price, and the price given for a limit order to sell is above the current market price. A *stop-loss order* is an order to sell below the market or to buy above the market. A *spread order* instructs the broker to buy one contract and sell a related contract. In a maturity or calendar spread, for example, the trader buys a contract in one maturity month and sells a contract in the same commodity for a different maturity month. In an intercommodity spread, the trader purchases a contract in one commodity and sells a contract in a different commodity. An almost unlimited array of spread transactions is available in futures and option markets, and these will be discussed in later chapters of this book. An important point to remember is that the trader in a spread transaction is interested in favorable changes in the price differential between two contracts.

### **Types of Markets**

Orders placed by customers with their brokers are transmitted through the brokerage firms' back offices to the floor of the appropriate exchange for execution. The mechanics by which such orders are executed differ between options on securities and futures. Futures and futures option contracts are traded in a pit in an "open outcry" format. Generally, one pit or ring is assigned to each commodity traded on an exchange. Traders stand on the steps around the pit and trade pair-wise with each other. Certain actively traded futures contracts, such as T-bond futures or S&P 500 index futures, attract in excess of 400 traders in the pit. Orders are received on the trading floor by telephone and transmitted to the appropriate trading pit by messengers. Unlike the stock market where trading in a particular stock occurs sequentially in time at a particular location on the floor, many transactions can occur simultaneously in an active futures contract. Futures markets do not therefore guarantee the same degree of price and time priority that stock markets guarantee because of the possibility that two simultaneous transactions might occur in different parts of the trading pit at different prices or because limit orders held by a particular broker may for some reason not be exposed to all other brokers in the crowd. Such price differences within the ring are, however, infrequent and small because many traders on each side of the market are each searching for the best

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<sup>5</sup>The Chicago Board of Trade (1989) provides useful information on trading procedures and other aspects of futures markets.

price. Competition among floor traders thereby reduces any price deviations within the pit and also provides tremendous liquidity for orders flowing in from the public.

Options on financial instruments are traded according to two different procedures. Options on securities exchanges such as the American Stock Exchange and the Philadelphia Stock Exchange are traded using the specialist system. In a specialist system, market orders are usually traded at the bid or ask price quoted by the specialist on his own behalf or on the behalf of limit orders previously left with the specialist, although there is an opportunity for other traders in the crowd to better the specialist's price. Limit orders are left with the specialist to be executed when the market price reaches the limit price. (In futures markets, each floor broker has his or her own "deck" of customer limit orders.) The specialist system has been criticized because only a single specialist makes a market in each option. As a result, investors do not have an opportunity to shop for better prices from other market-makers.

The Chicago Board Options Exchange (CBOE) system combines elements of futures markets and the specialist system of stock markets. An Order Book Official (OBO) maintains the book of limit orders but does not trade for his own account. At the same time, many professional floor traders are prepared to trade for their own accounts to absorb temporary imbalances and maintain market liquidity. More so than either the futures market system or the specialist system, the CBOE floor trading system represents what many have called for in the stock market: a system that combines competition among market-makers with full exposure of all limit orders through the open book of the OBO.

### Types of Traders

Floor traders in futures and option markets can be divided into two general classifications: floor brokers and professional traders. *Floor brokers* are agents who execute transactions for public customers such as processors of tangible commodities or portfolio managers of financial instruments. *Professional traders* buy and sell for their own accounts. Professional traders are sometimes called speculators because they take on varying amounts of risk. Professional traders in futures markets are often classified into position traders, day traders, and scalpers. *Position traders* take on risks and positions that are held for longer periods of time—days or weeks. *Day traders* have a short horizon and take on positions that are usually liquidated at the end of the day. *Scalpers* have a very short horizon and make their income primarily from short-term, minute-by-minute transactions. Scalpers provide liquidity to other investors by buying at the bid price when public customers desire to sell and by selling at the ask price when public customers desire to buy.

In stock exchanges, the major type of professional trader is the specialist. The specialist's role in the stock market is similar to the scalper's role in the futures market. Both are responsible for maintaining market liquidity, and profit from the spread between bid and ask prices. In a specialist system, however, there is only one specialist for each security. In futures markets, many scalpers compete in each contract. In securities markets, there are relatively few professional traders other than the specialist. Most position traders and day traders in options and stocks sub-



mit orders from off the exchange through brokerage firms. By contrast, in futures markets, a great deal of volume is the result of trading by professional traders on the floor.

### **Trading Costs**

The costs of trading options and futures consist of two components: the commission charges of the broker and the price concession that may be necessary to execute the transaction. The price concession reflects the fact that sales are made at the bid price of professional traders on the floor (scalpers or the specialist) and purchases are made at the higher ask price of professional traders on the floor. In addition, the broker carrying out a customer transaction is compensated by a commission. Commissions on futures and option exchanges are competitively determined and vary from broker to broker. Commissions cover the back-office services of the broker as well as the charges for floor brokerage and the clearing of transactions.

### **Price Reporting**

On stock exchanges, the price and size of each transaction is reported on the ticker tape immediately after the transaction occurs. In futures markets, not every transaction is reported because many transactions occur simultaneously. Instead, price reporters in the trading pit report each different transaction price and each different bid or ask price in the pit. Systems for price reporting differ among the futures exchanges. Some record prices manually on a price board above the exchange floor. The prices are then entered into computer terminals for transmission worldwide. Others enter price information directly into computer terminals, and then the information is automatically displayed on the exchange floor and is transmitted worldwide. In futures markets, statistics on the volume of trading are not available on a real time basis. Instead, such statistics are compiled at the end of the day on the basis of transactions clearing data.

## **2.4 THE CLEARING HOUSE**

Futures and option contracts are “created” instruments. When a buyer and a seller meet, a contractual agreement containing the specific rights and obligations of each party is created. The number of such contracts that are created is not limited, unlike stock markets where the supply of stock is limited to the number of shares that the firm has issued. *Open interest* is the number of futures or option contracts outstanding at any one time.

The clearing house is critical to the trading of futures and option contracts because it settles and guarantees the contracts. After a contract is agreed to, the clearing house interposes itself between buyer and seller and, in effect, becomes the party to whom delivery is made and from whom delivery is taken. Since the number of buyers always equals the number of sellers, the clearing house always has a zero net position.

Secondary markets in exchange-traded futures and options are made possible by two considerations: (a) the clearing house and (b) the standardized contract

design. A buyer who does not wish to hold a position until maturity enters into another contract of identical terms but on the opposite side prior to maturity. Since the individual is now buyer and seller of the same contract, the clearing house nets out the position. Most futures and options positions are not held to maturity but are offset in this manner prior to maturity.

In OTC markets, secondary market trading is not possible for two reasons. First, there is not a clearing house. This means that the buyer must negotiate with the particular seller with whom the contract was first arranged in order to undo the contract before maturity. This is cumbersome and also puts the party that seeks to reverse its position at a competitive disadvantage. Second, contracts in the OTC market are not standardized. Thus, even if a clearing house existed, it would be difficult to find traders on the other side willing to trade in a very specific instrument. OTC futures and options exist because the tailored contracts are sufficiently attractive to particular investors to offset the disadvantages of an absence of a secondary market.

Each of the futures exchanges has its own clearing organization. Options traded on SEC-regulated securities exchanges (NYSE, AMEX, Philadelphia Exchange, Pacific Exchange and the NASD) are issued and guaranteed by the Options Clearing Corporation (OCC).

## **Margin**

Aside from its clerical role of accounting for all contracts and overseeing delivery, the clearing house maintains the financial integrity of markets as guarantor of all contracts. Clearing members post margin deposits to guarantee the transactions carried out through that clearing member. Not all members of a futures or option exchange are members of the clearing house. Firms that are not members of the clearing house clear through member firms. The ultimate guarantor of the contract is the clearing house and its members. Most exchanges establish a guarantee fund that protects clearing members and therefore the customers of those clearing members. In futures markets, the clearing house imposes margin requirements on its clearing members. Customer margins are established by individual brokerage firms and are at least as high as the margins imposed by the clearing house. Margins on futures and futures option contracts are not set by any regulatory authority. Margins on stocks and stock options are regulated by the Federal Reserve Board and the SEC.

It is important to distinguish margins on futures and options from margins on common stocks. The margin on a common stock represents the percentage of the total purchase price paid by the investor. The remainder is borrowed. Currently, the minimum initial margin on common stocks, set by the Federal Reserve Board, is 50 percent. Margins on futures contracts represent a performance guarantee. When a futures contract is entered into, no credit is extended, no asset changes hands, and no payment is made by the buyer to the seller. Full payment (part of which could be borrowed at that time) is required only if delivery is made. Both the buyer and seller of a futures contract deposit margin, which may be in the form of interest-earning securities rather than cash. Positions in futures contracts are settled daily as the futures price changes. Traders are required to make up losses, if any, or are

permitted to withdraw profits, if any, each day. These payments from losers to gainers are called *variation margin* and must be in cash.

Options have some features of common stocks and some features of futures contracts. As in the case of common stocks, a payment is made when the option contract is entered into. The buyer of an option pays a premium for an insurance service rendered by the seller of an option. For example, the buyer of a call option has the right to purchase the underlying asset at a known exercise price and is insured against any losses should the underlying asset price fall below the exercise price. Although no asset changes hands when an option contract is entered into, payment for the “insurance service” is made, and money changes hands. Under current margin procedures for futures options as well as securities options, the buyer of the call or put pays 100 percent of the premium. The seller of the option is required to post margin as a performance guarantee, and the margin must be at least as great as the current market value of the seller’s obligation. In this way, the clearing house is assured that the seller’s obligations will be carried out.

### **Trading and Settlement Example**

Secondary market trading in futures and the role of the clearing house is perhaps best illustrated with the help of a simple example presented in Table 2.1. Suppose that *A* and *B* agree to trade one wheat futures contract (5,000 bushels at \$3.00 per bushel) on day 1. The volume of trading in day 1 is one contract, and open interest at the end of the day—the number of contracts outstanding—is also one. But, *A* does not settle profits and losses directly with *B*. The clearing house becomes buyer to *B* and seller to *A*. No money is paid by *A* to *B*. Instead, both *A* and *B* post margin with the clearing house. In the case of wheat, the margin is \$750 per contract for each party to the transaction and may be pledged in T-bills.

On day 2, *A* decides to sell. The clearing house becomes buyer to *A* and seller to a new entrant into the market, *C*. Since *A* is now a buyer and seller of the same contract on the books of the clearing house, *A*’s position is closed out by the clearing house. In effect, *C* replaces *A* as the offset long to *B*’s short position (without *B*’s knowledge). At the end of day 2, cumulative volume of trading is two contracts, and open interest remains at one.

The price of the wheat futures rose from \$3.00 to \$3.03 from day 1 to day 2. The value of *A*’s position therefore rose by \$150, so *A* makes \$150. Since *B* was a seller and prices rose, the value of *B*’s position falls by \$150, and, even though *B* did not enter into any transaction, *B* is required to pay \$150 in variation margin to the clearing house. Futures markets require the daily settlement of all positions whether or not a transaction is entered into. In forward contracts, profits and losses are realized only when an offsetting transaction is entered into or at maturity. Forward contracts therefore rely much more heavily on the adequacy of margins or other forms of guaranteeing the contract. In futures markets, the margin deposit is needed to protect only against the delay in collecting the variation margin from losers.

On day 3, *C* buys a second contract from *D*. The cumulative volume of trading through day 3 is three contracts, and open interest increases to two. The price of the wheat futures has fallen from \$3.03 to \$2.96, so *B* gains \$350 and *C* loses

TABLE 2.1 Example of trading in futures and associated cash flows.

Time	Buyer	Seller	Cum. Contract Volume	Open Interest	Futures Price	Contract Value	Daily Profit or Loss				Margin Cash Flow <sup>a</sup>				
							A	B	C	D	A	B	C	D	
1	A	B	1	1	3.00	15000					-750	-750			
2	C	A	2	1	3.03	15150	150	-150			750		-750		
3	C	D	3	2	2.96	14800		350	-350				-750	-750	
4	B	C	4	1	2.96	14800				200		750	750		
5	D	C	5	0	3.00	15000					-200		750	750	
Total							150	200	-150	-200	0	0	0	0	0

a. Margin deposits are required from both the buyer and the seller. We assume a constant margin deposit of \$750 (5%).

\$350. On day 4, *B* buys one contract and *C* sells one. Since these transactions offset previous positions established by *B* and *C*, open interest declines by one contract. Since the price did not change, no profits or losses are realized by any remaining participants in the market. On day 5, *C* sells one more contract, and *D* buys one. Since these transactions offset previously established positions, open interest declines to zero.

Futures trading is a zero-sum activity, as is reflected in the example by the fact that the sum of profits of the four traders is zero each day. On balance, *A* and *B* gain; *C* and *D* lose. To the extent that margin is pledged in cash, there is a net loss to traders in the form of foregone interest on the funds pledged as margins. However, if the margin is pledged in the form of interest earning assets such as U.S. Government Securities, this loss is avoided.

Table 2.2 presents a corresponding example of trading and settlement in call options on a common stock. The underlying contract is for 100 shares of the stock which on day 1 is selling for \$30. The option premium is assumed to be 10 percent of the contract value. The structure of the example is similar to the futures market example but there are some important differences. First, an option transaction requires the payment of a premium by the option buyer to the option seller. Thus, on day 1, *A* pays \$300 to *B*. Second, only sellers of options are required to post margin. Buyers of options pay the full premium and meet all their obligations at the time the premium is paid. Third, profits and losses arising from changes in the option price are not settled daily. The buyer of an option can realize gains only by entering into a transaction. Such gains are not transferred by a daily settlement procedure. Sellers of options do, in effect, realize gains and losses daily because they are required to adjust their margin positions by the amount of the gain or loss in the option. That is, their margin is marked-to-market daily. Thus, individual *B* must post an additional \$10 of margin on day 2 to guarantee the ability to purchase the underlying stock and deliver it.

## 2.5 SUMMARY

In this chapter, we first discuss the difference between over-the-counter (OTC) option and futures markets and organized exchange markets. In OTC markets contracts can be tailored to the particular needs of customers, but secondary market trading is difficult. In organized markets, contracts are standardized so that secondary market trading is facilitated. Another key distinction between organized futures and option exchanges and OTC markets is the existence of a clearing house. The clearing house is central to the operation of organized futures markets. It interposes itself between buyer and seller and guarantees contracts. It sets margins for clearing members and settles profits and losses daily. In contrast, in OTC markets, no clearing house exists. The parties make their own arrangements for guaranteeing the contract's financial integrity.

Next, the factors that must be considered in designing futures and option contracts are discussed. The design of contracts balances the benefits of a narrowly

TABLE 2.2 Example of trading in options and associated cash flows.

Time	Buyer	Seller	Cum. Contract Volume	Open Interest	Contract Value	Option Premium	Premium Cash Flow				Margin Cash Flow <sup>a</sup>							
							A	B	C	D	A	B	C	D				
1	A	B	1	1	3000	300	-300	300										
2	C	A	2	1	3100	310	310	-310										
3	C	D	3	2	2800	280	280	-280	280									
4	B	C	4	1	2800	280	280	-280	280									
5	D	C	5	0	3000	300	300	-300										
Total							10	20	-10	-20	0	0	0	0	0	0	0	0

a. Margin is required of the seller only. Margin requirements are complex and vary across contracts and exchanges. We assume a margin deposit of \$1000 plus the current value of the option.

and clearly defined contract against the benefits of a broadly defined contract that is less susceptible to manipulation and is more liquid.

Trading procedures are examined next. The basic types of orders that may be used are similar across markets, but trading procedures differ quite markedly and range from the open outcry procedures of futures markets to the specialist system used on certain option exchanges. Types of traders, trading costs, and price reporting procedures are also discussed.