

Chapter 1 Forward and Futures Markets

This chapter provides an introduction to forward and futures markets. The first section outlines the history of these markets. We then discuss forward contracts, which are private agreements between a financial institution and one of its corporate clients or between two financial institutions. These contracts are customized to fit precise needs. Unfortunately, because they are not standardized contracts, they are not usually liquid, and traders often have to maintain their positions until the contracted settlement date. That is, once a position is established, it may be difficult to get out of the position prematurely. In addition, since the contracts are private agreements, both parties are concerned about their partner's ability to make good on their bargain. That is, credit risk is a major concern. Futures contracts attempt to overcome liquidity and credit risk problems. This is accomplished by establishing standardized contracts which trade in organized exchanges. Daily settlement, margin requirements, the role of the clearinghouse, price limit moves and circuit breakers are described and examples of specific contracts are provided. This chapter also examines the types of futures contracts that exist and highlights the ingredients that make particular contracts successful.

The primary objectives of this chapter are the following:

- To introduce the history of forward and futures markets.
- To describe forward contracts.
- To explain futures contracts.
- To explain the role of the clearing house, marking to market, and margin requirements in reducing credit risk and enhancing liquidity.

An Overview of the History of Futures and Forward Markets in the U.S.

Futures markets arose from the need to reduce price risk in commodity markets. The risk of fluctuating commodity prices became evident during the mid 1800s in the grain market in Chicago. Each fall farmers would bring their grains to the city and attempt to sell them to grain merchants. The glut of grain over a small time period sharply dampened prices and farmers who arrived late would often have to accept extremely low prices for

their products. In the spring, shortages of grain would push prices to high levels. These wide price swings created huge price uncertainties for both suppliers and processors of grain. The fact that there was no centralized market place caused the marketing process between buyers and sellers to be inefficient.

Future markets emerged as a means for buyers and sellers to reduce price risk. In the late 1840s a group of businessmen in Chicago formed the Chicago Board of Trade (CBOT). The goals of the CBOT were twofold. First, it was to maintain a central market where buyers and sellers could do business in an environment where all traders were treated equally and fairly. Second, it was to collect and disseminate commodity and economic information and to establish quality control standards for all deliverable grades of grains.

The establishment of the CBOT met with success and resulted in a central point being created for collecting information about grain. Grain merchants were able to organize deliveries and to enter into contracts with farmers to purchase particular grades of grain, at particular delivery periods, for predetermined prices. The contracts, known as *to arrive* contracts, were desired by farmers because they reduced pricing and financing problems. The contract meant that the farmer would not have to ship grain to Chicago at harvest time and hope for the best prices, but instead could fix the price, time and location for delivery. Grain merchants also benefited since these contracts removed price risks.

Unfortunately, during times of heavy surpluses, grain merchants had incentives to break their contracts and to purchase their grains at cheaper market prices. Conversely, in times of unanticipated shortages, farmers had incentives to break their contracts if market prices exceeded their contracted delivery price. To ensure that contract obligations were met buyers and sellers were required to deposit good faith money with third parties. This money became known as *margin money*.

These *to arrive* contracts became more and more standardized. *Speculators* who used to purchase and then sell grain from their inventories in an attempt to profit, began buying and selling these contracts. Most speculators never owned or intended to own the underlying commodity. Their motive was simply to profit by following trading strategies which reflected their beliefs about the direction of movement in commodity prices. These speculators provided liquidity to the market. As a group, they were prepared to act as buyers of these contracts from farmers and as sellers of these contracts to manufacturers. That is, they would absorb the risk from traders who were looking to transfer them. Indeed, it was soon recognized that the primary economic function of these *to arrive* contracts was to transfer unwanted price risk from farmers and their customers, collectively referred to as *hedgers*, to these speculators, who were willing and able to bear it. Without the active involvement of speculators it would have been difficult for contracts to be initiated. In general, sellers want the highest possible prices while buyers want the lowest possible prices. Speculators, however, are less concerned about actual price levels. Rather, they base their decisions on the expected change in price levels, and hence are more likely to buy or sell from hedgers at all price levels.

By the 1870s the basic structure of trading these contracts had been established. Con-

tract specifications were carefully designed and the quality and quantity of commodities backing each contract type were established as was the careful use of margin. In addition, the CBOT adopted rules and regulations to ensure that the marketplace remained free and competitive. The rules governed both the conduct of traders buying and selling contracts on the trading floor and the actual delivery process to be followed.

As the Chicago Board of Trade grew, so did other futures exchanges. The New York and New Orleans Cotton exchanges served a vital role in the cotton industry. The Butter and Egg Board, forerunner of the Chicago Merchant Exchange, developed contracts on perishable commodities, where prices responded to seasonal variations. The development of contracts continued to grow at a steady rate until the early 1970s. By that time futures markets had proven their value as risk shifting mechanisms. Futures contracts on commodities included a variety of grains (corn, oats and wheat), livestock (pork bellies, live hogs, cattle) timber products (lumber and plywood), cotton, oil and meal (soybean, soymeal and soyoil) and foodstuffs (cocoa, coffee, orange juice, rice and sugar). Other contracts involved metals (gold, silver, copper and platinum) and petroleum products (heating oil, gasoline, crude oil and propane) existed. For most of these goods, contracts existed for a variety of delivery months. The delivery months were established to maximize the level of trading activity. For agricultural products the contract months were linked to harvest patterns.

In the late 1970s businesses faced risks from high inflation rates, deregulated financial markets and increasing volatile interest rates. Futures markets responded to the need by introducing financial futures contracts. Contracts on short term Treasury Bills, medium term Treasury notes and long term Treasury bonds were introduced. In addition, a very active market developed in Eurodollar deposits. In other countries financial futures contracts emerged on domestic interest sensitive securities. For example, in Japan an active market in government bonds exist. Not all contracts that were introduced were successful. For example, a contract based on Government National Mortgage Association bonds began trading in 1975. While it was initially successful, over time the liquidity of the contract dried up as traders found competing products more useful to hedge interest rate risk. Today, interest rate futures contracts account for a significant fraction of all futures contracts traded.

Futures contracts also exist on a variety of foreign currencies. For example, contracts exist on the British pound and the Japanese Yen. In the 1980s more types of contracts were introduced. In particular, index futures contracts began trading with cash settlements. These contracts have payouts linked to very specific indices. The majority of these indices are based on stock portfolios, but some contracts have payouts that depend on interest rate or foreign stock market indices.

While the futures markets were rapidly expanding, more informal markets were also evolving whereby individual parties could negotiate customized contracts involving future delivery of commodities at predetermined prices. These contracts were typically negotiated between corporate clients and financial institutions. An Over-The-Counter (OTC) market emerged, consisting of a network of brokers and dealers who negotiated transactions primarily over the telephone. In this market standardized products tend to slowly emerge with

market makers providing continuous bid and offer quotations. Prior to the 1980s, the primary OTC forward market was the interbank foreign exchange market, involving currency contracts. This market has no regular trading hours and currency contracts can be bought or sold somewhere 24 hours a day. In the 1980s the OTC market grew rapidly and a host of new instruments, largely in the interest rate arena evolved. In the 1990s the OTC market continued to mushroom as technology improved making it easier for brokers to arrange customized forward contracts to specifically meet the needs of corporations. In today's market place forward and futures contracts may exist on the same underlying commodities.

The Basics of Forward Contracts

An investor who holds a long (short) position in a forward contract agrees to buy (sell) a specific quantity of a specific asset at a specific date for a specific price. The date at which the actual transaction takes place is called the delivery date and the agreed upon price is called the *forward price*.

The contract can be viewed as a side bet on the future delivery price. The payoff of this bet is equal to the difference between the forward price and the actual spot price that exists at the delivery date. The contract is simply a sales agreement established in an over-the-counter market in which delivery and payments are deferred.

An investor who considers the forward price to be very low might pay a premium to obtain such a contract. Conversely, if the forward price is considered too high, the contract has inherent value to the seller. Clearly there is some intermediate price at which the contract will carry zero value. This price corresponds to the forward price. Thus, when a contract is initiated, the forward price is set such that there are no initial cash flows between the parties of the transaction. Let $F_{0T}(0)$ represent the forward price that exists at time zero, with settlement at time T .

Example

A cereal manufacturer requires rye in six months time and is concerned that prices of rye will rise in the interim. To remove the price uncertainty the manufacturer decides to enter into a forward contract with a particular grain elevator operator. In particular, the two parties enter into a contract which specifies the price per bushel that the cereal producer will pay to the grain elevator, upon receipt of the agreed upon quantity at the scheduled delivery date. The quality of the rye that is to be delivered is also specified. The contract may permit some flexibility in the delivery schedule. In particular, the contract may allow the grain elevator operator to dictate the exact day of a specified week for physical delivery to actually take place. Since the contract is a specific contract between two parties the exact terms will be negotiated to reflect their particular needs. The cereal manufacturer will buy the contract, or enter into a long position. The grain elevator will sell the contract, or enter into a short position.

Forward contracts are negotiated contracts that are entered into by two parties. As a result, the exact terms can be customized to individual needs. In particular, the two parties must spell out the quantity and quality of the delivered item, as well as the date and location of delivery. The consequences of failing to meet the obligations should also be laid out. Since each party may default, the credit worthiness of the counterparty is an important issue. The fact that the contract is customized to fit the needs of the two parties has its advantages. Unfortunately, it also has its downside. In particular, since the contract is unique, it may be difficult to establish its fair market value. As a result, if one party wants to terminate the contract prior to the delivery date, establishing the appropriate compensation to the counterparty may be difficult. Also, depending on the terms of the contract, permission may be required to trade the forward contract to another party.

Example

Reconsider the previous problem. Assume after 4 months, the cereal manufacturer, who is long the contract, realizes that the need to purchase rye in 2 months time no longer exists. Unfortunately, the manufacturer has this commitment to purchase in the future. Rather than accept delivery, and then resell the rye, the manufacturer is keen to renegotiate the contract with the grain elevator. Since rye prices have fallen dramatically over the last 4 months, the grain elevator has little incentive to renegotiate, unless it receives appropriate compensation. Establishing the appropriate level of compensation could be difficult.

The Basics of Futures Contracts

Future contracts overcome some of the credit risk and market liquidity problems associated with forward contracts.

An investor who takes a long (short) position in a futures contract agrees to buy (sell) a specific quantity of a specific asset in a specific time period at a predetermined price, called the futures price. Like forward contracts the futures price is set such that no payments are made when the contract is initiated.

Like a forward contract, the futures contract can be viewed as a side bet on the future delivery price. Unlike a forward contract, the payoff, equal to the difference between the final delivery and agreed price, is not received in one lump sum at the settlement date, but is received in daily amounts. The size of each payment is determined by the daily change in the futures price. If the futures price increase then the long receives a payment from the short for an amount equal to the difference. Conversely, if the futures price declines, the long incurs a loss equal to the drop in futures price. This process of daily resettlements is called *marking-to-market*. The effect of marking to market is to rewrite the futures contract each day at the closing daily futures price.

Let $F(t)$ be the futures price of a contract purchased at time t with delivery date T and let $S(t)$ be the spot price at date t . Exhibit 1 illustrates the daily cash flows from futures contracts for the long position.

Exhibit 1
Daily Cash Flows of a Futures Contract

Date	Futures Price	Spot Price	Cash Flow from Futures
0	$F(0)$	$S(0)$	-
1	$F(1)$	$S(1)$	$F(1) - F(0)$
2	$F(2)$	$S(2)$	$F(2) - F(1)$
	.	.	.
	.	.	.
	.	.	.
$T - 1$	$F(T - 1)$	$S(T - 1)$	$F(T - 1) - F(T - 2)$
T	$F(T)$	$S(T)$	$F(T) - F(T - 1)$

At the maturity date, T , the futures price for immediate delivery must equal the spot price. That is $F(T) = S(T)$. If the futures price was higher than the spot price, an astute investor would buy the spot, sell the futures and deliver immediately to capture riskless arbitrage profits. Similarly, if the futures price were below the spot price, the astute investor would buy the futures, take immediate delivery and then sell the spot to earn riskless profits.

Exhibit 1 shows that the net cash flows generated by the long position over the period $[0, T]$ equals the sum of the differences in daily settlement prices. Specifically, the net cash flow, $CF(0, T)$, is given by

$$\begin{aligned} CF(0, T) &= [F(T) - F(T - 1)] + [F(T - 1) - F(T - 2)] + \dots + [F(1) - F(0)] \\ &= F(T) - F(0) \\ &= S(T) - F(0) \end{aligned}$$

Notice that the net cash flow from the long position to the short position is exactly equal to the cash flow that takes place in a forward contract. However, with futures contracts daily payments or receipts are being made, whereas with forward contracts there are only single, lump sum payments.

Exhibit 2 shows the accrued profit to the long position under the assumption that all receipts of cash due to favorable moves in the futures price are invested in interest-bearing securities and losses are financed by borrowing. In this exhibit the interest rates for borrowing and lending are the same and are assumed to be constant. A \$1.0 investment at the riskless rate is assumed to grow to $\$R$ over a one day period.

The total accrued profit at date T is given by $\pi(0, T)$ where

$$\pi(0, T) = \sum_{i=0}^{T-1} [F(i+1) - F(i)]R^{(T-(i+1))}$$

Exhibit 2
Accrued Profit on a Long Position in a Futures Contract

Day	Futures Price	Cash-Flow	Accrued Profit (to date T)
0	$F(0)$	-	-
1	$F(1)$	$F(1) - F(0)$	$[F(1) - F(0)]R^{T-1}$
2	$F(2)$	$F(2) - F(1)$	$[F(2) - F(1)]R^{T-2}$
3	$F(3)$	$F(3) - F(2)$	$[F(3) - F(2)]R^{T-3}$
.	.	.	.
.	.	.	.
$T - 1$	$F(T - 1)$	$F(T - 1) - F(T - 2)$	$[F(T - 1) - F(T - 2)]R$
T	$F(T)$	$F(T) - F(T - 1)$	$[F(T) - F(T - 1)]$

Unlike the forward contract, the total profit on a futures position will depend on the sequence of price moves over the period. For example, if futures prices gradually increase and then decrease, the long position would first generate a sequence of early profits, which can earn interest over a long period, followed by a sequence of losses, which can be financed over shorter periods. Clearly, the long position is better off than if futures prices initially decreased and then returned to the same level.

With futures, the difference between the final spot price $S(T)$ and the initial futures price $F(0)$ is received or paid in daily installments throughout the life of the contract, whereas with forward contracts no cash flow occurs until settlement. As a result of the daily settling feature, the default risk of a futures style contract is much smaller than that of a forward contract. Specifically, since a forward contract only requires one cash flow at the delivery date, the chance that it is large, relative to any daily futures cash flow is high, and the possibility that the party cannot make the single payment is therefore higher. The process of daily settlements is referred to as *marking-to-market*.

Example

A trader enters a long position in 10 gold futures contracts at day 0. The futures price was \$370.50. The futures price is quoted on the basis of one troy ounce. Since each contract controls 100 troy ounces, the actual dollar price is obtained by multiplying the quoted price by 100. At the end of the day the future price was \$371.0. The futures prices for each of the 5 days remaining to the settlement date are shown below. The daily accrued profits for holding onto the 10 futures contracts on the assumption that the daily interest rate factor, R , is 1.00030.

Day	Futures Price	Cash-Flow per ounce per contract	Accrued Profit (to date T)
0	371.0	0.5	500.75
1	375.0	4.0	4004.80
2	375.0	0.0	0
3	374.5	-0.5	- 500.30
4	376.5	2.0	2000.60
5	378.0	1.5	1500.0
Total Five Day Profit			7,505.85

The change in the futures price in day 0 was \$0.50 per ounce, or \$50 per contract. Since 10 contracts were purchased, the total profit on day 0 is \$500. Investing these funds for five days leads to \$500.75. The total accrued value over the period is \$7,505.85. Notice, that cash flows into and out of the account every day. If the contracts purchased were forward contracts, then one cash flow at day 5 would occur. The size would be $(378.0 - 370.5) \times 100 \times 10 = \7500 .

Organized Futures Markets

The terms of any futures contract that trades in the US are determined by the exchange subject to the approval of the Commodity Futures Trading Commission. The specifications for each contract are the size, the delivery months, the trading hours, the minimum price fluctuations, the daily price limits, the delivery grades, and the process used for delivery.

As an example of a typical futures contract, consider the Corn Futures contract that trades on the Chicago Board of Trade (CBOT). Exhibit 3 provides the main features of the contract.

The size of the contract refers to the number of units underlying the contract. The corn futures contract requires delivery of 5000 bushels. If this contract size is too big then a smaller contract is available. In particular the Mid American corn futures contract has a trading unit of 1000 bushels.

The exchange establishes the grades that are acceptable for delivery. For the corn futures contract there are a number of deliverable grades. The price quotes are all based on Number 2 yellow corn. Number 1 yellow corn is deliverable at a 1/2 cent per bushel premium while Number 3 yellow corn is deliverable at a 1 1/2 cent per bushel discount on the settlement price.

The exchange is responsible for establishing the way in which prices are quoted and the minimum tick size. For the corn futures contract, prices are in cents and quarter cents per bushel with the tick size equal to one quarter of a cent. This translates to

Exhibit 3: Features of the CBOT Corn Futures Contract

Feature	Terms
Trading Unit	5,000 bushels
Tick Size	1/4 cent per bushel (\$12.50 per contract)
Daily Price Limit	10 cents per bushel (\$500 per contract) above or below the previous day's settlement price. No limit in the delivery month.
Contract Months	December, March, May, July, September.
Trading Hours	9.30am to 1.15pm(Chicago time), except on the last trading day of an expiring contract.
Last Trading Day	Seven business days before the last trading day of the delivery month.
Delivery Dates	Any business day in the delivery month.
Deliverable Grades	No. 2 Yellow Corn at par and substitutions at differentials established by the exchange.
Locations	Exchange approved grain elevators.

$(1/4)5000/100 = \$12.50$ per contract.

The exchange is also responsible for establishing the delivery months and how far into the future expiration dates should be set. Corn futures trade with delivery months in March, May, July, September, and December. For each expiration month, the exchange must establish deadlines for trading and for delivery. The last trading day for the corn futures contract is seven business days before the last business day of the delivery month. The last delivery day for this contract is the last business day of the delivery month. Hence for corn futures delivery can take place on any business day in the delivery month. The exact process of delivery is specified. Corn delivery takes the form of a warehouse receipt issued by an exchange approved elevator in Chicago, Illinois, or Burns Harbor, Indiana. Alternative destinations are in St. Louis, MO; Toledo, OH; East St. Louis, IL; and Alton, IL, at a four cent per bushel discount.

Trading takes place during specific times. The Corn futures trade from 9 : 30 a.m. to 1 : 15p.m(Chicago time) except on the last trading day of an expiring contract, when trading closes at noon. During the day, prices fluctuate continuously, in response to market information. The exchange imposes a limit to the daily price change. For the CBOT corn futures contract this limit is ten cents per bushel above or below the previous days

settlement price. If a contract hits its upper limit, the market is said to be limit up. The exchange has the authority to change the size of the limits at any point in time.

Futures prices are reported in most business sections of newspapers. Exhibit 4 shows the prices of a typical futures contract as reported in the Wall Street Journal. Each row contains information on a particular delivery month. The rows are ranked such that the earliest to mature contract is on the first line and the longest lived contract is on the last line. The first three columns give the opening, the high, and low prices for each contract. The settlement price is reported next. The settlement price indicates the value of the futures contract at the close of trading. If the futures contract has been actively trading at the end of the trading session then the settlement price most probably would be the last price. However, if the contract has not been trading, then the settlement price may be different from the last-traded price. Settlement prices are established by a committee which meets immediately after the market closes. The next column, denoted by “change,” represents the change in settlement price from the proceeding day. The next two columns give the lifetime high and low prices for the contract. The final column entitled “Open Interest” shows the total number of contracts outstanding for each maturity month. Open interest is discussed more fully later in this chapter. The volume of trading activity in the last two trading days is also reported.

Exhibit 4

Price information on Corn Futures Contract from the Wall Street Journal (Tuesday, July 27th 1999)

Date	Open	High	Low	Settle	Change	Lifetime High	Lifetime Low	Open Interest
Sept.	212 $\frac{1}{2}$	213 $\frac{1}{2}$	202	204 $\frac{3}{4}$	-7 $\frac{1}{4}$	280	184	96,804
Dec.	225	225	214 $\frac{1}{2}$	216 $\frac{1}{2}$	-8	291	194	172,961
Mar.	234	234 $\frac{1}{4}$	224	227 $\frac{1}{4}$	-6	270	206	39,344
May.	232	234 $\frac{1}{2}$	231	232 $\frac{1}{2}$	-7 $\frac{3}{4}$	261	213	7,840
July.	244 $\frac{1}{2}$	244 $\frac{1}{2}$	235	236 $\frac{3}{4}$	-7 $\frac{1}{2}$	278	219	9,350
Sept.	245	245	238	238	-5	255	225	844
Dec.	243 $\frac{1}{2}$	248	243	246 $\frac{3}{4}$	-3 $\frac{1}{4}$	279 $\frac{1}{2}$	232 $\frac{1}{2}$	6,866

Est. Vol. 87,000; Vol. Friday 114,654

Open Int. 334,015 (+2,771)

Opening a Futures Position

Customers wanting to trade futures must first open an account with a broker who is a futures commission merchant. Once accomplished, the customer can place a variety of orders. A *market order*, for example, instructs the broker to trade at the best price currently available. A *limit order* is a buy (sell) order that is to be filled at a specific price or lower (higher). A *fill-or-kill* order is a price limit order that must be filled immediately or canceled. A *stop order* becomes a market order only if a specific price is penetrated. A *market-if-touched* order is an order that becomes a market order if the futures contract trades at or

below the order price. A *day order* is entered for 1 day only, and is canceled if not filled by the end of the day.

Example

A limit order to buy one December futures with price \$3 1/4 is placed with the broker. The order is a day order. If the futures price never drops to \$3 1/4 by the end of the day, the order is canceled.

After receiving an order from a customer, the broker will direct it to the appropriate exchange. A broker who represents the firm on the floor of the exchange will attempt to execute the order according to the rules of the exchange.

At the CBOT, trading of futures is conducted in designated areas called trading pits. The trading pit consists of one or more consecutive rings of steps dropping towards the center. Trades for each delivery date are informally grouped together. Oftentimes, the contract with the earliest delivery date is the most actively traded and is traded on the topmost step of the pit, as close to the phone desks of the futures commission merchants. Alternatively, the pit could be divided like slices of a pie, with the different delivery dates trading in different slices.

The broker with the order may trade with another floor broker or with a professional trader. *Floor brokers* execute transactions for public customers. In contrast, *professional traders* trade for their own accounts. Professional traders can be classified into position traders, day traders and scalpers. *Position traders*, have definite views of the market and tend to hold onto specific positions over a period of time. For example, a bullish position trader may maintain a large long position in a futures contract, while a bearish position trader may maintain a short position. In contrast, *day traders* usually liquidate their positions at the end of each day. *Scalpers*, have very short time horizons and generate income by very active trades, possibly holding onto positions for a few minutes. Their activity of buying at the bid price and selling at asking prices helps to enhance the liquidity. Collectively, the group of professional traders are called speculators because they are prepared to take on varying amounts of risk.

Open Outcry Auctions

The price of a futures contract for commodity represents the expectations of a large number of buyers and sellers. Their combined knowledge based on all currently available information helps establish the futures price. As new events occur, investors expectations change and the futures price is reset. The actual price determination is established in the trading pits. The trading in the pit is referred to as an *open-outcry auction*. Trading may be quite hectic and noisy because traders face each other and make offers by open-outcry to buy or sell an announced number of contracts at an announced price. The bid and offer

prices are made openly for the benefit of all potential traders. Traders must be silent if they are not prepared to bid or offer at prices comparable to or better than the best current price. Generally, when the price is vocalized, only the last fraction of the whole price is stated. Grain futures, for example are traded in ticks of 1/4 cent per bushel so only the number of ticks are stated.

Example

Our broker has received a market-order to buy 1 July corn futures contract. The broker makes eye contact with another trader who is shouting "three at 1/2 : ". This trader is offering to sell up to 3 contract at 3 1/2. Possibly, another trader in the pit has vocalized a bid of "four for 1/4" indicating the desire to buy up to 4 contracts for 3 1/4. In any event our broker accepts the offered price. The customer now has a long position in 1 futures contract, at a futures price of 3 1/2.

The noise in the trading pit can be very loud, especially in active markets. As a result, a complex set of hand signals have evolved which clarify verbal bids and offers. These hand signals indicate price and quantity information as well as whether the trader is buying or selling.

The open outcry system may not be perfect. In certain pits there could be as many as 400 traders who are actively transacting. As a result, within the pit it is possible that simultaneous transactions might occur in different locations at different prices. Such occurrences, however, are infrequent and the magnitude of the price discrepancies will be small because all traders on the floor are aggressively searching for the best prices. As a result of the competition among these traders, price deviations within the pit will be negligible.

Once a deal has been struck both sides record the number of contracts, the contract type, the price, the name of the firm on the opposite side of the trade and the name of the trader on the other side. To help speed this process up, traders may wear color-coded clothing or letter-coded badges to identify their firm and their name. The time block at which the trade occurred must also be recorded. The first 30 minutes of trading constitutes block A, the next 30 minutes block B, etc.

Each trade is therefore recorded twice, once by each side. The transaction is also reported back to the customer. At the conclusion of trading, all traders submits their cards, called decks, to their clearing houses, where all cards are matched up. If any errors are identified attempts are made to clarify them before trading begins the next day.

Examples of Other Trading Auctions

(i) The Specialist System

The open outcry system of auctioning is quite different from the process adopted in the stock market. Typically, all trading in a particular stock is conducted through an individual *specialist*. The specialist maintains a "book" listing all outstanding limit orders entered by brokers on behalf of their clients. When limit orders can be executed at market prices, the specialist sees to the trade. The specialist also has to maintain a "fair and orderly" market by dealing personally in the stock. At any point in time the effective price at which the stock can be bought is the lower of the specialists offered or ask price and the lowest limit order sell price. Similarly, the effective price at which the stock can be sold is the higher of the specialists bid price and the highest limit buy order. By standing ready to trade at quoted bid and ask prices, the specialist is exposed to exploitation by traders who may have superior information. To reduce this risk they could in principle widen their bid-ask spreads. However, the exchange officials would not approve if the spread was excessive. Indeed, acceptable spreads are at levels such as 1/4 or 1/2 point. Specialists are compensated for bearing risk by the bid ask spread and by generating commissions on transactions. They also benefit by the proprietary information given by knowing the limit orders that have been posted in the book.

(ii) Electronic Trading

Another form of futures auction is *electronic trading*. In this system bids and offers are made electronically by traders who may be physically located all over the world. Buyers and sellers are matched together based on precise criteria of price and time. Bids and offers remain as standing orders until they are filled, changed or removed by the trader who entered them, or when trading closes. Any unfilled buy or sell orders are filled immediately at the best possible prices. Matching of orders is done on price first, and then time of entry.

An example of an international electronic system for futures contracts is GLOBEX. Globex was developed by Reuters Limited for use by the Chicago Board of Trade and the Chicago Mercantile Exchange. It allows for electronic trading of futures and options after the close of the exchange's trading floors. Globex is accessible around the world and extends the trading hours so that trading occurs virtually around the clock. We shall discuss this system in more detail in a future chapter.

Electronic trading has several advantages. First, it opens the market to physically distant traders. Second, it improves the speed and fairness of order execution. Third, it creates efficiencies in clearing and matching trades. Fourth, statistical information can be more readily captured and more efficiently distributed.

The Clearinghouse

Once a price is negotiated between two brokers on the floor of the exchange, the two parties cease to deal with each other. Instead, they deal with the clearinghouse. The

clearinghouse guarantees that all obligations are met, by breaking up every trade and becoming the seller for every buyer and buyer for every seller. Thus, all traders look to the clearinghouse to maintain their side of the bargain, rather than to other traders. Since the number of contracts purchased by the clearinghouse equals the number sold, its net position is always zero.

Example

In the above example, the buyer of 1 July futures contract need not know the seller. Indeed, after the transaction is made, at a price of \$31/4 per bushel, the clearing house steps in and breaks up the trade so that both parties now deal with the clearinghouse. The buyer is obligated to receive corn from the clearinghouse for predetermined funds and the seller is obligated to deliver corn to the clearinghouse in exchange for the same predetermined amount. Overall, the clearing house has no position in corn. It is obligated to receive and sell corn at the price of \$31/4 per bushel.

Because of the clearinghouse, the two parties do not need to trust each other. Rather, they only have to trust the clearinghouse. Since clearinghouses are large well capitalized financial institutions this default risk is small. Nevertheless, the position of the clearinghouse is not completely free of risk. In particular, if either the buyer or seller cannot meet a cash-flow obligation and defaults, then the clearinghouse still has to make good on the other side of the transaction. Clearinghouses are nonetheless able to guarantee all trades made on the floor of exchanges because they require their members deposit margin monies based upon their customer positions. These margins act as financial safeguards to ensure that each firm is able to perform on their customers' positions. The size of these margins, called *clearing margins*, is usually based on the overall position of each member that trades on the floor. Before providing more information on the margin system we address some of the additional benefits this clearing procedure provides.

Closing a Futures Position

So far we have only discussed how an order to buy or sell is initiated. After a position is entered into, the trader can either choose to continue holding the position or to close out the position by a reversing trade. If the trader chooses to do nothing, then at the end of each day the position is marked-to-market and the contract is rewritten at the new futures price. On the other hand, during the course of the day, the trader may unwind the position by doing a reversing trade as illustrated next.

Trader A buys a futures contract on January 1st. The contract requires delivery of the underlying commodity in May. To establish the price for future delivery there has to be a seller of the May contract. Assume customer B is the seller of the contract, and assume the futures price is \$100. Once the price is determined, A and B cease to trade with each

other. As far as A is concerned, the contract is with the clearinghouse. Now suppose that over the next three weeks prices have risen by \$5 and the futures price is \$105. Since the contract is marked to market daily, A has already received a \$5 profit (ignoring interest) and now has a commitment to purchase the commodity at \$105. This \$5 profit has come at the expense of losses experienced by customer B. Customer B now has an obligation to sell at \$105. Regardless of whether B defaults on its obligations, A still will receive its payments from the clearinghouse.

Assume that at this time A wants to unwind his position. To do this A instructs his broker to sell 1 May contract. Assume that at this time another trader, C say, is looking to purchase the contract. Assume the current futures price is \$105. As soon as this transaction price is established A and C cease to deal with each other. In particular, A has now just entered into a short position with the clearinghouse. From A's perspective he has an obligation to buy at \$105 and another offsetting obligation to sell at \$105. From the clearinghouse's perspective, they have an obligation to buy from customer B and sell to customer C at the current futures price of \$105.

The total number of futures contracts of a given commodity that have not yet been offset by an opposite futures transaction is referred to as *open interest*. Open interest differs from *total volume*. Volume refers to the total number of purchases *or* sales made during a specified period of time. Often the volume of transactions is reported over the trading day.

By having a clearinghouse, the tracking of obligations between individual parties simplifies. Prior to the existence of a clearinghouse, brokers had to maintain complex accounting records, called *rings* to keep track of who would ultimately deliver to who. In the above example, without a clearinghouse, the ring is quite simple with trader B ultimately dealing with trader C, but with more offsetting transactions occurring the ring could get more complex.

Example: Offsetting Trades

(i) On March 1st an investor places a market-order for 1 July corn futures contracts. The price was \$3 1/2. A month later the trader places a stop-loss order instructing the broker to sell the futures contract if prices fell below \$3. Later that day this threshold was penetrated and the order was executed. (ii) On March 1st another trader placed a market order to sell a July corn futures contract at \$3 1/2. In May, with the futures price at \$3, the trader decided to close out the position by going long on one July futures contract. Ignoring the marking to market profits and losses, as well as any transaction costs, the net profit on this strategy is 50 cents or 2 ticks worth \$25 per contract.

The Delivery Process

If a futures contract is not unwound by an offsetting trade, then delivery will be made against the contract. Over 95% of contracts are offset. Most clearinghouses do not make or take delivery. Rather, they provide the mechanism that enables sellers to make delivery to buyers.

Example

Consider a short position in the corn futures contract that wants to make delivery in the delivery month. The clearing firm representing the seller first notifies the clearinghouse that its customer wants to make delivery. The date at which this is done is called the *position day*.

The next day, before the market opens, the clearinghouse matches the seller to a buyer. The rule used for assigning a buyer varies from random selection to selecting the buyer who has been long the longest period of time. The clearing firm representing the seller then sends an invoice to the clearinghouse, and a copy is forwarded to the clearing firm representing the buyer. this day is called *the notice day*.

The next day the seller receives a check from the buyers clearing firm, and in return receives a warehouse receipt. This day is called *the delivery day*.

Margin Deposits

As discussed earlier, clearinghouses are able to guarantee all transactions by requiring that all clearing member firms deposit clearing margin that is sufficiently large enough to ensure that their customer accounts will perform. The initial clearing margin is usually based on the net long or net short position. As an example, a clearing member firm with a short position of 100 corn futures and a long position of 50 corn futures contracts is required to deposit margin based on a net short position of 50 contracts. In some exchanges margin determination by *netting* is not allowed. In this case margin deposits would be required for both the long and the short positions.

Typically, margin levels are about 5 percent of the value of the underlying commodity, and are sufficient to cover the daily maximum price fluctuations. The clearing margin can be posted in cash, Treasury securities or letters of credit issued by approved banks. Each evening, the clearinghouse recomputes the margin requirements for each of its members. If margins increase, the member has to provide additional funds before the market opens. If margins decrease, the excess funds can be withdrawn. In periods of great price volatility, the clearinghouse can require its member firms to deposit initial margin. Indeed, if the volatility rapidly expands, the initial margin could increase to as high as 30% of the spot price. The margin requirements vary according to the product and can vary substantially according to the exchange. For example, the margin requirements in Japanese exchanges

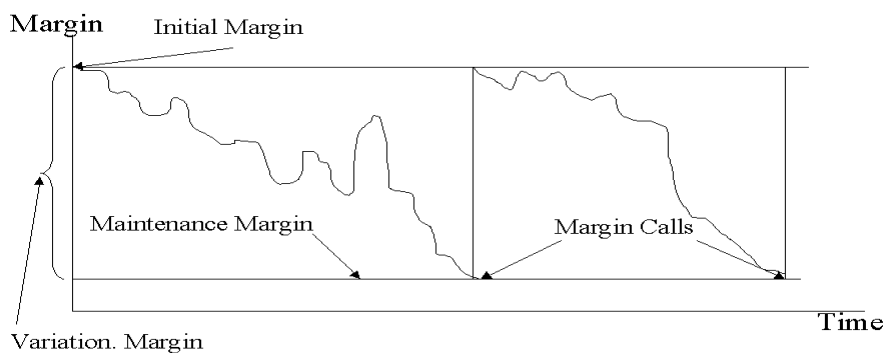
are generally much higher than in the US.

Each brokerage firm is responsible for the performance of its clients' positions. To protect itself from customer defaults, in order to trade a futures contract, the brokerage firm will require its customers to post an *initial margin*. The amount of margin required varies according to the type of contract traded and the quantity may also vary according to which broker is used. Usually, the margin requirements for individual customers is higher than the margin that is required from the firm to the clearinghouse.

The daily cash flows that occur due to marking-to-market are added or subtracted from this account. If losses occur, and the level of funds in the account drops below a certain level, called the *maintenance margin*, the trader is required to replenish the account, bringing the margin deposit back to its initial level. The amount required to bring the deposit back up is referred to as *variation margin*. If the variation margin is not paid, the broker will close out the futures position. The maintenance margin is usually about 75% of the initial margin. Gains above the initial margin level can be withdrawn from the account. The minimum levels for initial margin and maintenance margins are set by the exchanges. Individual firms may set higher levels than these minimum levels for their clients. The exchanges frequently adjust these levels. In particular, if the underlying commodity displays increased volatility, then margin requirements may be increased.

It is the broker's responsibility to make sure these margin requirements are met. The clearinghouse does not deal with individual customers. Rather, it deals with its clearing members. Brokers who are not members of the clearinghouse, must therefore arrange to have their trades cleared through other brokers who are members of the clearinghouse.

Margin Calls



Example

The initial margin deposited in the margin account for a buyer of a gold futures contract is \$2000. The futures price was \$397.0 per troy ounce, with each contract controlling 100 troy ounces. The underlying spot price was \$385.0. Exhibit 5 shows the cash flows in and out of the account, under the assumption that the maintenance margin is \$1500. Interest on funds in the margin account are ignored.

Exhibit 5
Margin, Margin Calls and Variation Margin

Date	Futures Price	Cash Flow	Margin Account	Comments
0	397	-	2000	
1	398	100	2100	
2	400	200	2300	
3	399.50	-50	2250	
4	398.70	-80	2170	
5	396.50	-220	1950	
6	396.20	-30	1920	
7	395.0	-120	1800	
8	393.0	-200	1600	
9	391.5	-150	1450	
10	392.5	100	1550	← Margin call issued. \$550 of variation margin required.(regardless of what happens on day 10)
11	392.60	10	2110	←Variation margin received
12	393.50	90	2200	
13	393.50	-	2200	← Investor requests a withdrawal of \$200.
			2000	
14	394.00	50	2050	

The purchase of 100 troy ounces at date 0 would have cost \$38,500. The initial margin of \$2000 thus represents just over 5% of the value of the spot. If the volatility of gold rapidly expanded, then the exchange might very well increase the initial margin to a higher fraction of the spot price.

The marking to market feature, the role of the clearinghouse and margin requirements, all aim at reducing the credit risk of futures markets. Other institutional features that also attempt to reduce default risk are present. These are daily price limits and circuit breakers. Price limits control the maximum price move a futures contract can make in any one day. The size of the price limits are established by the exchange. They reserve the right to change them, and indeed, in volatile periods they usually do expand them. *Circuit breakers* are rules invoked by the exchange to stop trading if prices are exceedingly volatile. The idea behind circuit breakers is to temporarily halt trading in cases where panic has set in and the effect of mob psychology has driven prices out of line with their fundamental values.

The introduction of circuit breakers, and the usefulness of price limits are controversial, because they serve to decouple the futures prices from their underlying commodity prices. While these rules can reduce the magnitudes of loss by traders in any given day, their real value is not yet well understood.

Current Futures Markets

Futures on physicals refer to contracts on commodities such as grains, livestock and metals. Futures on interest sensitive assets and on indices command a larger market share, in terms of volume, than physicals. The two largest futures exchanges in the US are the Chicago Board of Trade and the Chicago Mercantile Exchange. There are about 15 other important exchanges. The Wall Street Journal provides the names of the exchanges for the contracts it reports on. In addition to the US exchanges, there are approximately 60 other commodity exchanges around the world that trade a variety of futures contracts. In England the largest exchanges are the London International Financial Futures Exchange (LIFFE), the London Metals Exchange (LME), the International Petroleum Exchange (IPE), the London Futures and Options Exchange (FOX), and the Baltic International Freight Futures Exchange. The most active futures markets in Europe are the Marche a Terme des Instruments Financiers (MATIF) in Paris, the Stockholm Options Market (OM) in Sweden, the Deutsche Terminboerse (DTB) in Frankfurt, the Financiele Termijnmarkt in Amsterdam and others in Denmark, Ireland, Switzerland and Finland. In Japan, financial futures were banned until 1985. Since then the Japanese market has rapidly expanded. The largest futures markets are the Tokyo International Financial Futures Exchange (TIFFE), the Tokyo Stock Exchange (TSE), the Tokyo Commodity Exchange (TCE), and the Osaka securities exchange (OSE). In Australia, the Sydney Futures Exchange (SFE) is the largest. Other exchanges in nearby time zones include the New Zealand Futures Exchange (NZFE), the Hong Kong Futures Exchange (HKFE) and the Singapore International Monetary Exchange (SIMEX). In South America the largest exchange is the Sao Paulo Commodities Exchange or Bolsa de Mercadorias (*BM&F*). In Canada, the largest exchanges are the Montreal Exchange (ME), the Toronto Futures Exchange (TFE), the Toronto Stock Exchange (TSE), the Vancouver Stock Exchange (VSE) and the Winnipeg Commodity Exchange (WCE).

Heavily traded futures contracts include interest rate products such as T bond futures, Eurodollar contracts and contracts on other government bonds. Contracts on stock market indices, such as the *S&P* 500 futures contract, are also liquid. Foreign currency futures, and contracts on physicals, such as crude oil, gold, corn and soybeans are also actively traded.

Until recently, the CBOT and the CME controlled over 40% of the futures market. In terms of growth rates, the non US market is growing more rapidly than the US market. Indeed, in the 1990s the growth rates in volume of the European futures markets, especially in London's LIFFE, Europe's biggest exchange, in Paris's MATIF, and in Frankfurt's DTB exchange. Among the responsibilities of each exchange is marketing its products. As a result, all the exchanges have voluminous literature on their specific products and these materials are readily available.

Design Features of Futures Contracts

In designing a contract, the delivery parameters such as location, quality and timing must be specified in detail. The deliverable item should have certain properties. Specifically it should be homogeneous, easily identified and be in competitive supply so that no single investor or group of investors are able to control the supply of the deliverable security.

Under the terms of a future contract, the seller is required to deliver the underlying asset or commodity at the maturity of the contract. At first glance it seems desirable to pin down the contract very precisely so as to eliminate any uncertainty regarding delivery terms and quality characteristics. However, if the contract is too precise, it increases the likelihood of *price squeezes* on the underlying asset. That is, as the delivery date nears, the demands for transactions in the underlying spot market may increase dramatically, and this may cause temporary price distortions. To reduce this pressure there may be advantages in having some flexibility in the contract. Consequently, many futures contracts are designed to have some flexibility with regard to delivery terms and acceptable varieties of underlying assets that can be delivered.

Different types of contracts have evolved which incorporate these types of flexibilities. For example, the seller of the CBOT corn futures contract is required to deliver 5000 bushels of corn in the delivery month. However, the seller has significant flexibility that allows some variation as to when, where, how much, and what will be delivered. These flexibilities are referred to as the timing option, the location option, the quantity option, and the quality option.

The timing option allows the sellers to deliver the contracted asset on any allowable business day in the delivery month. If the asset could be rented profitably during this month, then the seller will delay delivering to capture these profits. For futures on physicals, the timing option is expected to be exercised early since holding of items like metals and agricultural produce is expensive. However, for financial futures, where the underlying instrument may be a coupon bearing instrument deferring delivery may be advantageous.

Some contracts have a *quantity option* that allows the seller to deliver an amount that deviates slightly from the requirement. This prevents deliveries being refused for small departures. If less (more) is delivered than the contracted amount, the cash paid by the futures buyer is reduced (increased) by the shortfall times the prevailing spot price. Since these adjustments are made at current spot prices, there is no advantage to over or under deliver. Hence quantity options are relatively unimportant considerations for establishing futures prices.

The quality option allows the seller to deliver one of a variety of specified assets. Increasing the number of deliverables against the contract reduces the likelihood of squeezes developing on any specific underlying commodity. The CBOT corn futures contract allows for three deliverable varieties. The benchmark variety is the No. 2 yellow corn which is deliverable at par. Number 1 yellow corn carries a half cent premium while No. 3 yellow corn carries a discount of one and a half cents per bushel. Clearly, at delivery time the seller will select that grade to deliver which minimizes cost of delivery. The variety that is cheapest to deliver is referred to as the cheapest to deliver variety.

Wheat futures contracts permit the delivery of eleven different types of wheat, while soybean futures permit four varieties of soybean. The Chicago Board of Trade's Treasury bond futures contract has at least 20 different Treasury bonds which can be delivered against the contract. Since the cheapest to deliver asset changes from time to time, this flexibility provided to the short position, is clearly quite valuable.

Futures contracts on commodities specify that delivery may occur at a few specified locations. This provides futures sellers with opportunities to reduce storage and shipment costs associated with the delivery. This is important for agricultural commodities where storage in plentiful seasons can be scarce and costs high. The *location option* reduces the chance that the sellers will be squeezed by expensive local storage areas.

Trading restrictions imposed by the exchange produce additional delivery options. An example of a trading restriction option, is the *wildcard option*. It arises if the futures market closes before the spot market. As an example, consider the case of a futures market closing at 2pm, but where the short position had until 5pm to determine whether to deliver or not. Say on a particular day, after the futures markets closed, a significant event occurred that dramatically changed the prospects for the underlying commodity. While prices in the spot market would respond, the effective futures price would remain unchanged at its closing price. The short position may choose to deliver against the contract now, and receive the 2pm futures price, rather than wait for the next day when the futures price will adjust to a price that reflects the new information. This ability to choose to deliver based on information that came out after the close of the futures market has value to the short position.

Since all the above delivery options provided to the seller are valuable, they should be reflected in the setting of the futures price. In particular, as the number of delivery options in a futures contract increases, the long position will require increased compensation in the form of a lowering in the futures price.

Innovations, Successes and Failures

Not every futures contract that has been introduced has been successful. Far from being static, futures exchanges are constantly innovating contracts. In the 1960s, just over 50 new types of exchange traded contracts were introduced. In the 1970s over 100 new contracts were introduced, and in the 1980s the number of innovations was still greater. Not all new futures contracts have been successful. Indeed, it appears that a minority of contracts stand the test of time and emerge as successful innovations. Of all new contracts introduced in the 1960s and 1970s, perhaps one-quarter of them have had modest or better success. To be successful a contract has to satisfy a clientele of hedgers who would find these contracts highly efficient for laying off risk that they do not want to bear. Specifically, the new contract has to provide a clear advantage over competing alternatives. This means the effectiveness of hedging with the new contract is better and the cost of hedging is reduced. Also, these market should attract speculators who are willing to assume the risk that hedgers want to unload. If the contract is too narrowly defined, then it could be of interest to a very small selective group of hedgers, and speculators may not enter the market. Typically, speculators

like contracts to have some breadth, or flexibility in the deliverables. In the industry, they refer to these flexibilities as "dirt". If a contract has a small amount of "dirt", then the group of hedgers is more likely to be diverse, have different opinions and the chances are higher that speculators will enter the market. Of course, if the contract contains too much "dirt", then hedgers may conclude that the product does not meet their specific needs, and they may shy away from the product.

Generally speaking, contracts that are based on underlying commodities, the prices of which can be readily and continuously observed and not manipulated, are the most likely to succeed. Contracts, for example, that have payouts linked to the levels of an index, which is only updated periodically, is less likely to succeed. For example, a futures contract based on a consumer price index, is unlikely to be successful if the consumer price index is only updated at periodic points in time. For such contracts, the information that affects the updates in the index is not known to the same degree by all participants. Less informed traders will shy away from trading since they will feel that they are being exploited by traders who have access to the proprietary information that is required to update the index.

There are several examples of contracts that were initially successful but eventually lost out to newer competing products that had clear advantages. Introducing new futures contracts is expensive for the exchange. Not only do they have the research and development costs, but they also have to make sure the appropriate trading and information systems are in place and that the public are well informed about the potential uses of the product. Also, the costs of obtaining regulatory approval for trading can be very high. Of course, the benefits to the exchange of being the first to introduce an innovative product that is successful are high. Indeed, once an active market is established, it is very difficult for a second exchange to gain market share by offering competing products.

Over-the-Counter Forward Contract Markets

The alternative to an exchange traded futures contract is to purchase a tailor made forward contract from a commercial or investment bank, or a brokerage firm. The advantage of doing this is that a precise instrument can be designed to manage the risk of the specific situation. Of course, this customization comes at a cost. Moreover, if circumstances change, and the firm wants to unwind its position, the cost of accomplishing this will typically be much higher than the cost of doing this using exchange traded instruments.

In the last decade, interest in products offered in over-the-counter derivatives markets has mushroomed. Products that once were considered highly specialized and custom designed for specific applications have now become more standardized. Initially, investment banks and brokerage firms offered these products to their corporate clients at significant mark-ups. However, as these products became more common, these dealers began making markets in them by continuously offering to buy and sell them. In this market, dealers communicate their quotes to each other through electronic quotation systems.

The increase in trading in some of these products forced prices to become more competitive. As the mark-ups on these products were lowered, the liquidity benefits of using

exchange traded products diminished, making these products more attractive to firms that had previously been reluctant to use them. In addition, the ability to terminate these contracts prior to their settlement dates, by simple offsetting transactions became possible. As a result, for these products, the differences between forward and futures contracts began to narrow. Of course, unlike futures contracts, since these contracts are between specific parties, credit risk still remains.

The following table summarizes the basic differences between forward and futures contracts. However, as just discussed, the degree of the differences depends on the particular situation, and in some circumstances, the differences between forward and futures contracts are less acute.

Of course, there are many reasons firms may look to forward markets. First, a firm may not find a suitable futures contract, through which they can hedge. This may stem from the fact that there is no futures contract on the underlying commodity, or even on similar types of commodities. Alternatively, the hedger may want to offset a particular risk over a time period that exceeds the longest futures settlement date. Establishing long dated forward contracts may be more sensible than attempting a risk management strategy that involves rolling over consecutive futures contracts. Finally, the firm may not have the in-house expertise, and would rather pay a premium in the over-the-counter market for a tailor designed contract that meets the precise needs of the firm than attempt their own trading strategies in the futures markets. In any case, off-exchange traded products cannot go ignored. Indeed, over the five year period ending in 1993, the volume of exchange traded products grew by just over 38%, while over-the-counter markets increased by 800%. In many cases the decision of which market to use is a difficult one. We certainly will have more to say about this point in future chapters.

Exhibit 6: Forward Contracts versus Futures Contracts

	Forward Contracts	Futures Contracts
Contract size	Negotiable	Standardized
Delivery Date	Negotiable	Standardized
Trading Locations	Trade in over-the-counter dealer-type markets	Trade in futures exchanges
Price Determination	Negotiated in private by buyer and seller. "Resale" prices have to be negotiated.	Prices determined by open outcry in an auction type market at an exchange.
Cash Flows	Exchange of cash flows takes place infrequently. Oftentimes, the only cash flow occurs at the delivery date.	Exchange of cash flows occur daily, as the contract is marked to market.
Security Deposit	Depends on the credit relationship between buyer and seller. No intermediary, or clearinghouse that guarantees performance.	Buyers and sellers post performance margin with the exchange. Daily settlements take place. Clearinghouse guarantees fulfilling futures contract obligation.
Frequency of Delivery	Most contracts held to term. Few contracts are closed out prior to maturity. In some cases may be difficult to unwind a position.	Most contracts are closed out by offsetting trades prior to the delivery date.
Regulation	Forward markets are self-regulated.	Futures markets are regulated by specific agencies. (Commodity Futures Trading Commission, National Futures Association, and by the Exchanges)

Conclusion

This chapter has provided an overview of forward and futures markets. Forward contracts are private agreements between a financial institution and one of its corporate clients

or between two financial institutions. These contracts are customized to fit precise needs. Unfortunately, because they are not standardized contracts, they are not usually liquid. That is, once entered into, the contract may not be easily unwound. In addition, since the contracts are private agreements, both parties are concerned about the ability of their partner's ability to make good on their side of the bargain. That is, credit risk is a major concern. Futures contracts attempt to overcome liquidity and credit risk problems. This is accomplished by establishing standardized contracts which trade in organized exchanges, and by designing features that reduce credit risk and enhance liquidity. These features include daily settlement, margin requirements, the role of the clearinghouse, price limit moves and circuit breakers.

This chapter also identified the most important futures contracts and the most important futures exchanges. In the early 1990s the most successful futures contracts have been based on interest rate products. Indeed, of the top 10 future contracts worldwide, seven of them are interest rate contracts. In the next few chapters we shall examine how futures contracts can be used to effectively manage the risk exposure faced by certain individuals or firms. The differences between forwards and futures were described. Exchange traded products and over-the-counter products are both very important, and future chapters will deal with both of them in greater detail.

References

The following introductory texts on futures markets all contain good discussions on futures markets. Most exchanges publish material on their products. The booklets produced by the CBOT, in particular, are very informative, and are strongly recommended.

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Exercises

- (1) Suppose a trader enters into a long position in a gold futures contract for 100 ounces. The contract expires in 100 days. The initial margin is \$2000 per contract.
 - (a) Explain why a trader might enter into a long position?
 - (b) Ignoring interest on funds in the margin account, compute the value of the account after 14 days assuming the futures price increased by \$1 a day for 10 days and then remained unchanged.
 - (c) After 14 days the trader decides to liquidate her position. Explain the process of offsetting the contract and compute the dollar profit from this investment.
- (2) A firm enters into a short futures contract to sell 5000 bushels of wheat for 200 cents per bushel. The initial margin is \$2500 and the maintenance margin is \$2000.
 - (a) What price change would lead to a margin call?
 - (b) Under what circumstances could \$1000 be withdrawn from the margin account?
 - (c) What basic function do the margin rules serve?
- (3) A trader calls his broker and issues instructions to purchase 1 silver futures contract. The order is a limit order with price 510 cents, and is a day order.
 - (a) Explain what the broker should do?
 - (b) If the trade is initiated, what sequence of events occurs? In particular, explain what could happen to the open interest. Also explain the role of the clearinghouse.
- (4) Suppose a gold dealer has 100,000 ounces of gold and is concerned about price declines over the next 3 months. The dealer observes that the gold could be delivered against COMEX gold futures contracts.
 - (a) Should the dealer buy or sell futures? How many contracts may be appropriate, and what settlement date would you recommend.
- (5) A new futures contract on apples is being considered. Three grades of apples are established to satisfy delivery requirements, namely grades A , B and C . The recorded futures price is based on grade A . Let F represent the futures price. Adjustments are made to F if grades B or C are delivered. If the grade is B , the effective futures price

is $0.98F$. If the grade is C , the effective futures price is $0.97F$. Assume the futures price at the settlement date is $F = \$10.0$.

- (a) What should the spot price of A be at the settlement date?
- (b) If, at the delivery date, the spot prices of grade A, B and C were 10, \$9.70 and \$9.70 respectively, then what grade should the short position deliver? Explain why the set of prices seem inconsistent.
- (6) A corn farmer in Iowa expects to harvest 20,000 bushels of corn in early November. He has set a price objective at \$1.72 per bushel or better. In April, the futures price for corn is \$1.94. Explain the strategy he could follow to lay off price risk. Comment on what could go wrong.
- (7) The party with a short position in a futures contract has quality, timing and delivery options. Do these options increase or decrease the futures price? Explain.
- (8) Comment on what would happen if contracts were marked to market once a week rather than once a day. In particular, comment on the risk borne by the clearing house, and on adjustments that may have to be made on margin accounts.

Possible Projects

(1) Research the current trends towards computer trading as opposed to open outcry auctions. Report on trends at specific exchanges and comment on the future of the open outcry system. Which auction system seems to be the most common? What are the benefits of open outcry? What drawbacks do computer trading systems present?

(2) Go to the web pages of specific exchanges and research specific futures contracts. Discuss their economic rationale, how they trade etc.

(3) Research the specific margin requirements of one or two exchanges. Comment on their differences.

(4) The CBOT and CME have several research articles on the web sites. Find a topic that interests you and bring it to class. Be ready to present some information.

(5) Set up a training manual that goes into significant detail about the trading mechanism for specific products at a specific exchange.