CHAPTER 17

Futures Markets

Introduction

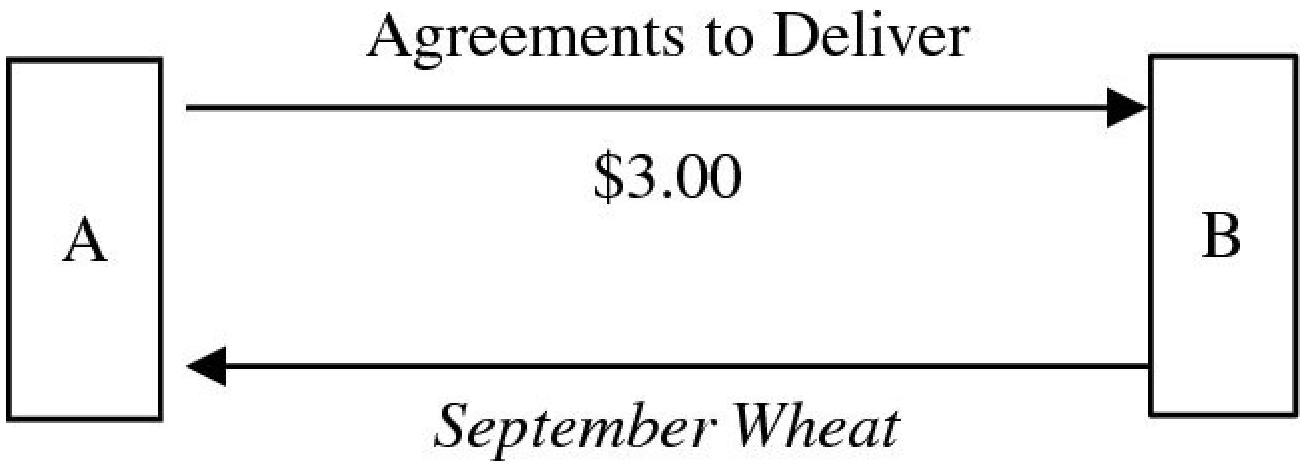
A *forward contract* is an agreement between two parties to trade a specific asset at a future date with the terms and price agreed upon today. A *futures contract*, in turn, is a "marketable" forward contract, with marketability provided through futures exchanges that list hundreds of standardized contracts, establish trading rules, and provide for clearinghouses to guarantee and intermediate contracts. In contrast, forward contracts are provided by financial institutions and dealers, are less standardized and more tailor-made, are usually held to maturity, and unlike futures, they often do not require initial or maintenance margins. Both forward and futures contracts are similar to option contracts in that the underlying asset's price on the contract is determined in the present with the delivery and payment occurring at a future date. The major difference between these derivative securities is that the holder of an option has the right, but not the responsibility, to execute the contract (i.e., it is a contingent-claim security), whereas the holder of a futures or forward contract has an obligation to fulfill the terms of the contract. In this chapter, we examine the markets and fundamental uses of futures and forward contracts.

The Nature of Futures Trading and the Role of the Clearinghouse

Futures Positions

An investor or hedger can take one of two positions on a futures (or forward) contract: a long position (or futures purchase) or a short position (futures sale). In a long futures position, one agrees to buy the contract's underlying asset at a specified price, with the payment and delivery to occur on the expiration date (also referred to as the delivery date); in a short position, one agrees to sell an asset at a specific price, with delivery and payment occurring at expiration.

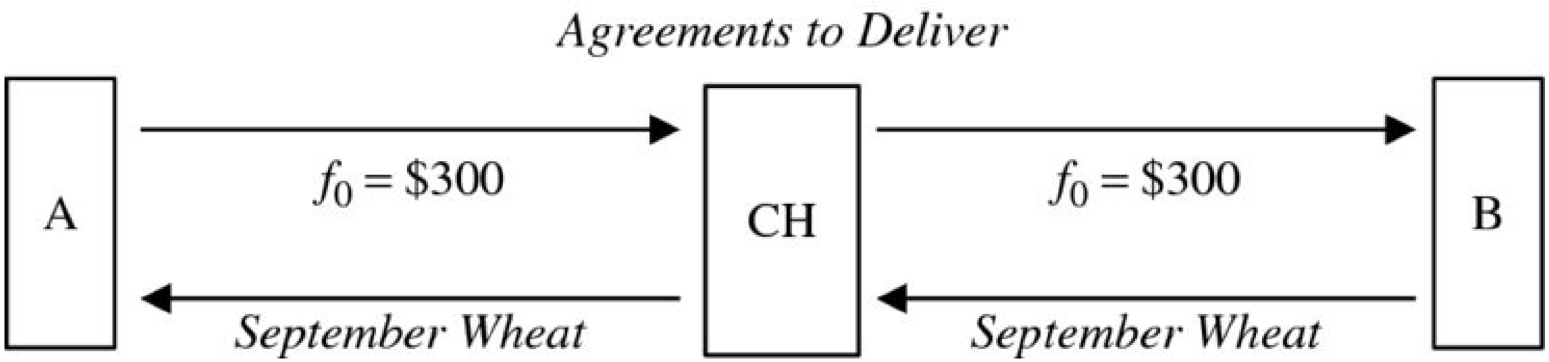
To illustrate how positions are taken, suppose in June, Speculator A believes that the upcoming summer will be unusually dry in the Midwest, causing an increase in the price of wheat. With hopes of profiting from this expectation, suppose Speculator A decides to take a long position in a wheat futures contract and instructs her broker to buy one September wheat futures contract listed on the CBT (one contract is for 5,000 bushels). To fulfill this order, suppose A's broker finds a broker representing Speculator B, who believes that the summer wheat harvest will be above normal and therefore hopes to profit by taking a short position in the September wheat contract. After negotiating with each other, suppose the brokers agree to a price of $3.00/bu on the September contract for their clients. In terms of futures positions, Speculator A would have a long position in which she agrees to buy 5,000 bushels of wheat at $3.00/bu from Speculator B at the delivery date in September, and Speculator B would have a short position in which he agrees to sell 5,000 bushels of wheat at $3.00/bu to A at the delivery date in September:



If both parties hold their contracts to delivery, their profits or losses would be determined by the price of wheat on the spot market (also called cash, physical, or actual market). For example, suppose the summer turns out to be dry, causing the spot price of wheat to trade at $3.50/bu at the grain elevators in the Midwest at or near the delivery date on the September wheat futures contract. Accordingly, Speculator A would be able to buy 5,000 bushels of wheat on her September futures contract at $3.00/bu from Speculator B, then sell the wheat for $3.50/bu on the spot market to earn a profit of $2,500 before commission and transportation costs are included. On the other hand, to deliver 5,000 bushels of wheat on the September contract, Speculator B would have to buy the wheat on the spot market for $3.50/bu, then sell it on the futures contract to Speculator A for $3.00/bu, resulting in a $2,500 loss (again, not including commission and transportation costs).

Clearinghouse

To provide contracts with marketability, futures exchanges use clearinghouses. Like the Option Clearing Corporation, the clearinghouses associated with futures exchanges guarantee each contract and act as intermediaries by breaking up each contract after the trade has taken place. Thus, in the above example, the clearinghouse (CH) would come in after Speculators A and B have reached an agreement on the price of September wheat, becoming the effective seller on A's long position and the effective buyer on B's short position:

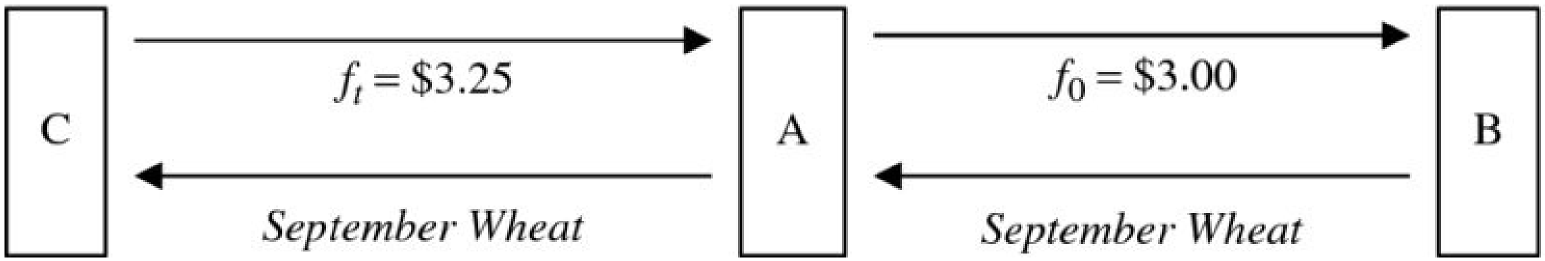


Once the clearinghouse has broken up the contracts, then A's and B's contracts would be with the clearinghouse. The clearinghouse, in turn, would record the following entries in its computers:

Clearinghouse Record:
1. Speculator A agrees to buy September wheat at \$3.00/bu from the clearinghouse.
2. Speculator B agrees to sell September wheat at \$3.00/bu to the clearinghouse.

As we earlier discussed with the Option Clearing Corporation, the intermediary role of the clearinghouse makes it easier for futures traders to close their positions before expiration. Returning to our example, suppose that the month of June is unexpectedly dry in the Midwest, leading a third speculator, Speculator C, to want to take a long position in the listed September wheat futures contract. Seeing a profit potential from the increased demand for long positions in the September contract, suppose

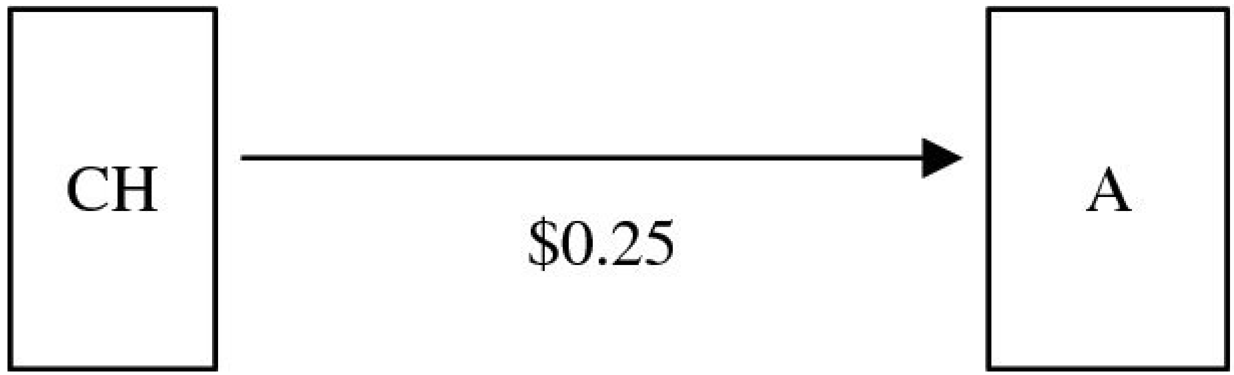
Speculator A agrees to sell a September wheat futures contract to Speculator C for $3.25/bu. Upon doing this, Speculator A now would be short in the new September contract, with Speculator C having a long position, and there now would be two contracts on September wheat. Without the clearinghouse intermediating, the two contracts can be described as follows:



After the new contract between A and C has been established, the clearinghouse would step in and break it up. For Speculator A, the clearinghouse's record would now show the following:

Clearinghouse Record:
1. Speculator A agrees to buy September wheat at $3.00/bu from the clearinghouse.
2. Speculator A agrees to sell September wheat at $3.25/bu to the clearinghouse.

Thus:



The clearinghouse accordingly would close Speculator A's positions by paying her $0.25/bu ($3.25/bu – $3.00/bu), a total of $1,250 on the contract [(5,000 bu) ($0.25/bu)]. Since Speculator A's short position effectively closes her long position, it is variously referred to as a *closing*, *reversing out*, or *offsetting position* or simply as an *offset*. Thus, the clearinghouse, like the Option Clearing Corporation, makes it easier for futures contracts to be closed prior to expiration.

Commission costs and the costs of transporting commodities cause most futures traders to close their positions instead of taking delivery. As the delivery date approaches, the number of outstanding contracts (*open interest*) declines, with only a relatively few contracts still outstanding at delivery. Moreover, at expiration, the contract prices on futures contracts established on that date (f_T) should be equal (or approximately equal) to the prevailing spot price on the underlying asset (S_T). That is:

$$\text{At expiration: } f_T = S_T$$

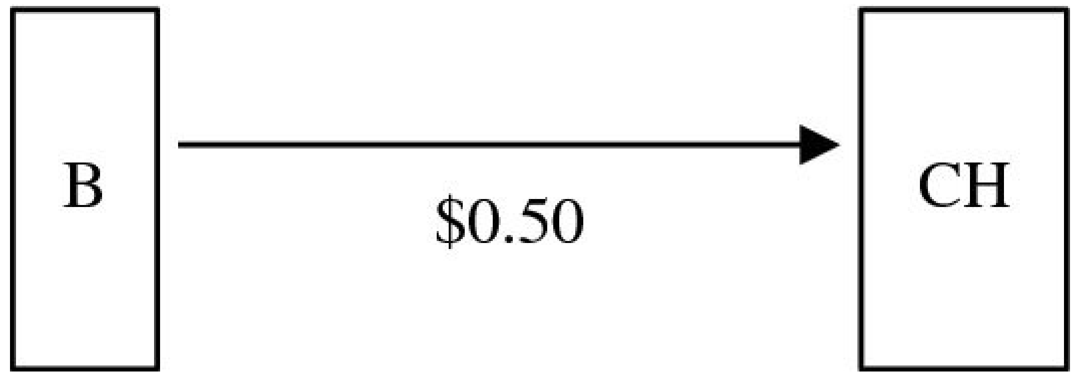
If f_T does not equal S_T at expiration, an arbitrage opportunity would exist. Arbitrageurs could take a position in the futures contract and an opposite position in the spot market. For example, if the September wheat futures contract were available at $3.40 on the delivery date in September and the spot price for wheat were $3.50, then arbitrageurs could go long in the September contract, take delivery by buying the wheat at $3.40 on the futures contract, then sell the wheat on the spot at $3.50 to earn a riskless profit of $0.10/bu. Arbitrageurs' efforts to take long positions, however, would drive the contract price up to $3.50. On the other hand, if f_T exceeds $3.50, then arbitrageurs would reverse their strategy, pushing f_T to $3.50/bu. Thus, at delivery, arbitrageurs will ensure that the prices on expiring contracts are equal to the spot price. As a result, closing a futures contract with an offsetting position at expiration will yield the same profits or losses as closing futures positions on the spot by purchasing (selling) the asset on the spot and selling (buying) it on the futures contract.

Returning to our example, suppose near the delivery date on the September contract the spot price of wheat and the price on the expiring September futures contracts are $3.50/bu. To close his existing short contract, Speculator B would need to take a long position in the September contract, while to offset her existing contract, Speculator C would need to take a short position. Suppose Speculators A and B take their offsetting positions with each other on the expiring September wheat contract priced at $f_T = S_T =$ $3.50/bu. After the clearinghouse breaks up the new contract, Speculator B would owe the clearinghouse $0.50/bu and Speculator C would receive $0.25/bu from the clearinghouse:

Clearinghouse Records for Speculator B:

1. Speculator B agrees to *sell* September wheat to CH for $3.00/bu.
2. Speculator B agrees to *buy* September wheat from CH at $3.50/bu.

Thus:

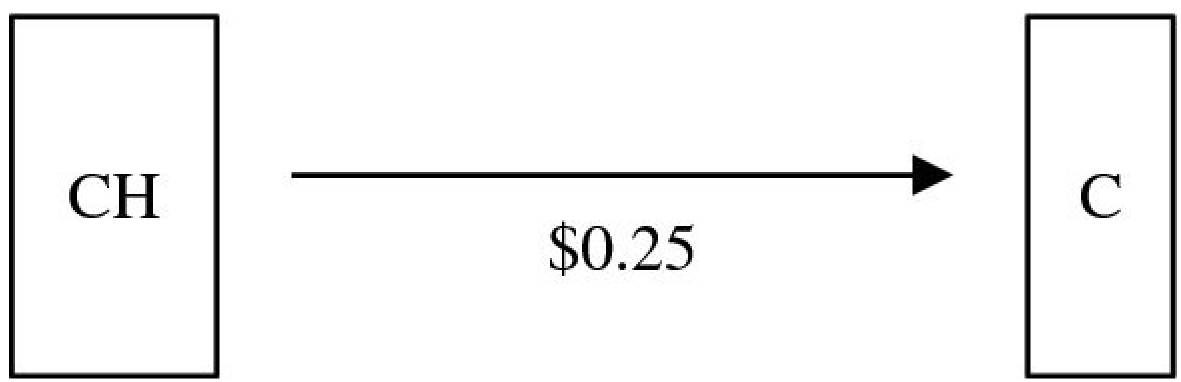


And:

Clearinghouse Records for Speculator C:

1. Speculator C agrees to *buy* September wheat at $3.25/bu.
2. Speculator B agrees to *sell* September wheat for $3.50/bu.

Thus:



To recapitulate, in this example, the contract prices on September wheat contracts went from $3.00/bu on the A and B contract, to $3.25/bu on the A and C contract, to $3.50/bu on the B and C contract at expiration. Speculators A and C each received $0.25/bu from the clearinghouse, while Speculator B paid $0.50/bu to the clearinghouse, the clearinghouse with a perfect hedge on each contract received nothing (other than clearinghouse fees attached to the commission charges), and no wheat was purchased or delivered.

The Market and Characteristics of Futures Contracts

Microstructure

For many years, the mode of trading on futures exchanges in the United States, London (LIFFE), Paris (MATIF), Sydney (SFE), Singapore (SIMEX), and other locations was that of brokers and dealers going to a pit and using the *open outcry* method to trade. In this system, orders were relayed to the floor by runners or by hand signals to a specified trading pit. The order was then offered in open outcry to all participants (e.g., commission brokers or locals [those trading for their own accounts]) in the pit, with the trade being done with the first person to respond.

Although the open-outcry system is still used, electronic trading systems are today the primary mode used by the organized exchanges to trade derivatives. The CME and CBT developed with Reuters (the electronic information service company) the *GLOBEX* trading system. This is a computerized order-matching system with an international network linking member traders. Since 1985, all new derivative exchanges have been organized as electronic exchanges. Most of these electronic trading systems are order-driven systems in which customer orders (bid and ask prices and size) are collected and matched by a computerized matching system. In addition to linking futures traders, the futures exchanges also make contracts more marketable by standardizing contracts, providing continuous trading, establishing delivery procedures, and providing 24-hour trading through exchange alliances.

Standardization

The futures exchanges provide standardization by specifying the grade or type of each asset and the size of the underlying asset. Exchanges also specify how contract prices are quoted. For example, the contract size on most wheat contracts is 5,000 bushels.

Continuous Trading

On many futures exchanges, continuous trading is not provided by market makers or specialists, but instead through locals who are willing to take temporary positions in one or more futures. These exchange members fall into one of three categories: *scalpers*, who offer to buy and sell simultaneously, holding their positions for only a few minutes and profiting from a bid-ask spread; *day traders*, who hold positions for less than a day; *position traders*, who hold positions for as long as a week before they close. Collectively, these exchange members make it possible for the futures markets to provide continuous trading.

Price and Position Limits

Without market makers and specialists to provide an orderly market, futures exchanges can impose price limits as a tool to stop possible destabilizing price trends from occurring. When done, the exchanges specify the maximum price change that can occur from the previous day's settlement price. The price of a contract must be within its daily price limits, unless the exchange intervenes and changes the limit. When the contract price hits its maximum or minimum limit, it is referred to as being limited up or limited down. In addition to price limits, futures exchanges also can set position limits on many of their futures contracts. This is done as a safety measure both to ensure sufficient liquidity and to minimize the chances of a trader trying to corner a particular asset.

Delivery Procedures

Only a small number of contracts lead to actual delivery. Nevertheless, detailed delivery procedures are important to ensure that the contract prices on futures are determined by the spot price on the underlying asset and that the futures price converges to the spot price at expiration. The exchanges have various rules and procedures governing the deliveries of contracts and delivery dates. The date or period in which delivery can take place is determined by the exchange. When there is a delivery period, the party agreeing to sell has the right to determine when the asset will be delivered during that period.

Alliances and 24-Hour Trading

In addition to providing off-hour trading via electronic trading systems, 24-hour trading is also possible by using futures exchanges that offer trading on the same contract. A number of exchanges offer identical contracts. This makes it possible to trade the contract in the United States, Europe, and the Far East. Moreover, these exchanges have alliance agreements making it possible for traders to open a position in one market and close it in another.

Margin Requirements

Since a futures contract is an agreement, it has no initial value. Futures traders, however, are required to post some security or good faith money with their brokers. Depending on the brokerage firm, the customer's margin requirement can be satisfied either in the form of cash or cash equivalents.

Futures contracts have both initial and maintenance margin requirements. The *initial* (or *performance*) *margin* is the amount of cash or cash equivalents that must be deposited by the investor on the day the futures position is established. The futures trader does this by setting up a margin (or commodity) account with the broker and depositing the required cash or cash equivalents. The amount of the margin is determined by the margin requirement, defined as a proportion (m) of the contract value (usually 3 percent to 5 percent). For example, if the initial margin requirement is 5 percent, then Speculators A and B in our first example would be required to deposit $750 in cash or cash equivalents in their commodity accounts as good faith money on their $3.00 September wheat futures contracts:

$$m[\text{Contract Value}] = 0.05[(\$3.00/\text{bu})(5{,}000 \text{ bu})] = \$750$$

At the end of each trading day, the futures trader's account is adjusted to reflect any gains or losses based on the settlement price on new contracts. In our example, suppose the day after Speculators A and B established their respective long and short positions, the settlement price on the September wheat contract is f_t = $3.10/bu. The value of A's and B's margin accounts would therefore be:

$$\text{A: Account Value} = \$750 + (\$3.10/\text{bu} - \$3.00/\text{bu})(5{,}000 \text{ bu}) = \$1{,}250$$
$$\text{B: Account Value} = \$750 + (\$3.00/\text{bu} - \$3.10/\text{bu})(5{,}000 \text{ bu}) = \$250$$

With the higher futures price, A's long position has increased in value by $500 and B's short position has decreased by $500. When there is a decrease in the account value, the futures trader's broker has to exchange money through the clearing firm equal to the loss on the position to the broker and clearinghouse with the gain. This process is known as *marking to market*. Thus in our case, B's broker and clearing firm would pass on $500 to A's broker and clearing firm.

To ensure that the balance in the trader's account does not become negative, the brokerage firm requires a *maintenance margin* (or *variation margin*) be maintained by the futures traders.[1] The maintenance margin is the amount of additional cash or cash equivalents that futures traders must deposit to keep the equity in their commodity account equal to a certain percentage (e.g., 75 percent) of the initial margin value. If the maintenance margin requirement were set at 100 percent of the initial margin, then the equity value of A's and B's accounts would each have to be at least $750. If Speculator B did not deposit the $500 required margin, then he would receive a *margin call* from the broker instructing him to post the required amount of funds. If Speculator B did not comply with the margin call, the broker would close the position.

Maintaining margin accounts can be viewed as part of the cost of trading futures. In addition to margin requirements, transaction costs are also involved in establishing futures positions. Such costs include broker commissions, clearinghouse fees, and the bid-ask spread. On futures contracts, commission fees usually are charged on a per contract basis and for a round lot, and the fees are negotiable. The clearinghouse fee is relatively small and is collected along with the commission fee by the broker. The bid-ask spreads are set by locals and represent an indirect cost of trading futures.

It should be noted that the margin requirements and clearinghouse mechanism that characterize futures exchanges also serve to differentiate them from customized forward contract positions written by banks and investment companies. Forward contacts are more tailor-made contracts, usually do not require margins, and the underlying asset is typically delivered at maturity instead of closed; they are, however, less marketable than exchange-traded futures.

BLOOMBERG COMMODITY SCREENS, CTM

Exchange-listed commodities can be found by accessing the CTM screen: CTM <Enter>. Contracts are listed by category, exchange, and region. For example, to find a stock index on the Chicago Mercantile Exchange (CME), use the CTM "Exchange" screen and click "Equity Index" from the drop-down menu in the "Category" column; to find wheat contract on the Chicago Board of Trade (CBT), use the Chicago Board of Trade "Exchange" screen and click "Wheat" from the dropdown menu in the "Category" column.

The menu screen for the contract is accessed by entering the commodity's ticker, pressing the "Comdty" key, and hitting <Enter>: Ticker <Comdty> <Enter> (e.g., for CBT wheat futures: KWA <Comdty> <Enter>. The menu includes: CT: Contract Table, GIP: Intraday Graph, EXS: Expiration Schedule, and GP: Price Graph.

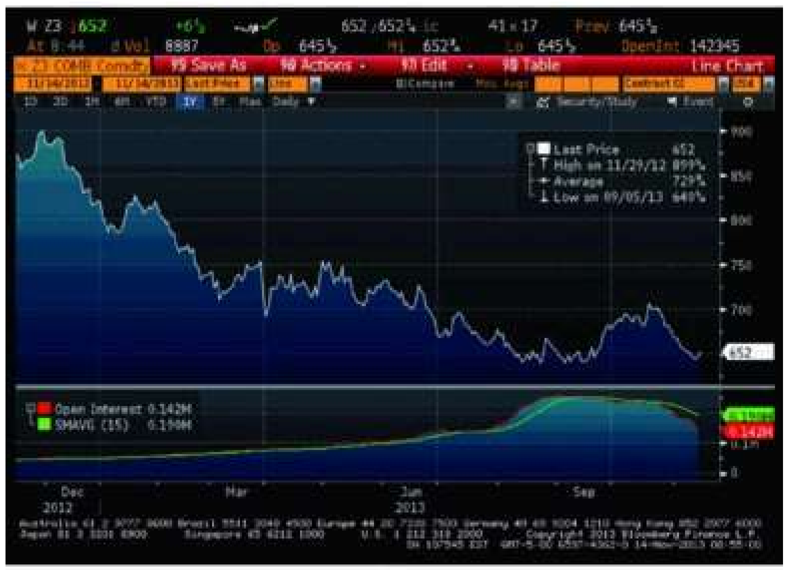
See Bloomberg Web Exhibit 17.1.

Equity Index Futures

Equity Index Futures Contracts

Futures contracts on the exchanges and OTC contracts can be classified as a physical commodity, energy, stock index, foreign currency, or interest-earning asset. Of these, there are a number of futures index contracts available. Many of these contracts are on stock indexes, but there are also some on commodities (e.g., DJ-AIG Commodity Index and the GSCI index), bond indexes (e.g., Municipal Bond Index), and currencies (e.g., the U.S. dollar index). Exhibit 17.1 shows Bloomberg description and price screens on the CME's S&P 500 futures contract. The S&P 500 futures, as well as other index futures contracts, have many of the same characteristics as index options. For instance, like index options, the size of index futures contracts are equal to a multiple of the index value, and like index options, index futures are cash-settled contracts.[2]

(a)



(b)

EXHIBIT 17.1 S&P 500 Futures Contract: Bloomberg Description and Price Screens, SPA <Comdty>

Futures markets provide corporations, financial institutions, and others with a tool for speculating on expected spot price changes, for hedging their particular spot positions against adverse price movements, and for creating synthetic positions.

Speculative Strategies

As a speculative tool, stock index derivatives represent a highly liquid alternative to speculating on the overall stock market or on different types of stock indexes (e.g., Russell 2000, Russell 1000, Nasdaq 100 or S&P Midcap 400 index). Combined, index options and index futures give speculators a tool for generating a number of different investment strategies. As we examined in Chapter 16, option strategies such as outright call and put positions, straddles, strips, spreads, and combinations can be formed with spot index options, making it possible for investors to speculate on expected bullish, bearish, or even stable market expectations with different return-risk exposures. In the case of stock index futures, bullish (bearish) speculators can take a long (short) position in an index futures contract.

In addition to outright positions, a speculator who wants to profit from directional changes in the market, but who does not want to assume the degree of risk associated with an outright position, can instead form a spread with stock index futures. A *futures spread* is formed by taking long and short positions on different futures contracts simultaneously. Two general types of spreads exist: intracommodity and intercommodity. An *intracommodity spread* is formed with futures contracts on the same asset but with different expiration dates; an *intercommodity spread* is formed with two futures contracts with the same expiration but on different assets.

An intracommodity spread is often used to reduce the risk associated with a pure outright position. The prices on more distant futures contracts (T_2) are more price sensitive to changes in the spot price, S, than near-term futures (T_1):

$$\frac{\%\Delta f_{T_2}}{\%\Delta S} > \frac{\%\Delta f_{T_1}}{\%\Delta S}$$

A risk-averse spreader who is bullish on the stock market could form an intracommodity spread by taking a short position in a nearer-term index futures contract and a long position in a longer-term one. If the market subsequently rises, the percentage gain in the long position on the distant contract will exceed the percentage loss on the short position on the nearby contract. In this case, the spreader will profit, but not as much as she would with an outright long position. On the other hand, if the market declines, the percentage losses on the long position will exceed the percentage gains from the short position. In this situation, the spreader will lose, but not as much as she would have if she had an outright long position. Note that in forming a spread, the speculator does not have to keep the ratio of long-to-short positions one-to-one, but instead could use any ratio (2-to-1, 3-to-2, etc.) to obtain his desired return-risk combination.

Instead of an intracommodity spread, a spreader alternatively could form an intercommodity spread by taking opposite positions in different index futures. For example, suppose the relation between the Russell 2000 index and the Russell 1000 index is such that when the Russell 2000 changes by 10 percent, the Russell 1000 changes by 9 percent. A risk-averse investor who is bearish on the market could set up an intercommodity spread by going short in the Russell 2000 contract and long in the Russell 1000 contract. Thus, similar to option spreads, index futures spreads allow investors to attain lower return-risk combinations than pure speculative positions. Moreover, by changing the ratios from one long to one short or by forming intercommodity spreads with different correlations, spreaders can attain a number of different return-risk combinations.

Hedging Equity Positions

Futures markets and OTC forward contracts provide investors, businesses, and other economic entities a means for hedging their particular spot positions against adverse price movements. Two hedging positions exist: long hedge and short hedge. In a *long futures hedge* (or hedge purchase), a hedger takes a long position in a futures contract to protect against an increase in the price of the underlying asset or commodity. Long hedge positions are used, for example, by manufacturers to lock in their future costs of purchasing raw materials, by portfolio managers to fix the price they will pay for securities in the future, or by multinational corporations that want to lock in the dollar costs of buying foreign currency at some future date. In a *short hedge*, one takes a short futures position to protect against a decrease in the price of the underlying asset. In contrast to long hedging, short hedge positions are used, for example, by farmers who want to lock in the price they will sell their crops for at harvest, by portfolio managers and investment bankers who are planning to sell securities in the future and want to minimize price risk, or by multinational corporations who have to convert future foreign currency cash flows into dollars and want to immunize the future exchange against adverse changes in exchange rates.

Short Hedge Example

To illustrate how a short hedge works, consider the case of a portfolio manager, who in January knows that he will have to liquidate his stock portfolio in June and decides to hedge the value of the stock portfolio by taking a short position in the June S&P 500 futures contract. Assume in this case that the portfolio is well-diversified (no unsystematic risk), has a beta of 1.25, and in January it is worth $50,000,000 when the S&P 500 spot index (S_0) is at 1,250. Finally, suppose a June S&P 500 futures contract is priced at 1,250 with a $250 multiple. To hedge the portfolio, the manager would need to go short in 200 S&P 500 contracts:

$$N_f = \beta \frac{V_0}{f_0} = 1.25 \frac{-\$50,000,000}{(1,250)(\$250)} = 200 \text{ contracts}$$

In June, the manager would liquidate his portfolio and receive or pay a cash settlement equal to the difference in the futures price (f_0) and the closing spot price on the S&P 500 (S_T) on the delivery day: $f_0 - S_T$. (The manager more likely would close the futures contract by going long in the expiring June contract trading near the spot price: $f_T = S_T$). With the short position, any loss in the market would be offset by a gain on the futures position. However, any gain in the market would be negated by a loss on the futures position. This can be seen in Exhibit 17.2. In the exhibit, the first column shows five possible S&P 500 spot index values from 1,000 to 1,500; the second column shows the proportional change in S&P 500 from the 1,250 value of the index when the hedge was set up; column 3 shows the proportion changes in the portfolio given its beta of 1.25; column 4 shows the portfolio values that correspond with the index values; column 5 shows the cash flow at expiration from one future position; column 6 shows the cash realized from the 200 short index futures contract at the June expiration; and column 7 shows the value of the futures-hedged portfolio of $50,000,000.

(1) S&P 500 Spot Index at Expiration: $S_T = f_T$	(2) Proportional Change in the S&P 500: $(S_T - 1{,}250)/1{,}250$	(3) Proportional Change in Portfolio Value: $\beta g = 1.25(S_T - 1{,}250)/1{,}250$	(4) Portfolio Value: $(1+\beta g)$ \$50M	(5) Short Futures Cash Flow per Contract: $f_0 - S_T = 1{,}250 - S_T$	(6) Futures Cash Flow: 200(\$250) $(1{,}250 - f_T)$	(7) Hedged Portfolio Value: (4) + (6)
1,000	−0.20	−0.25	$37,500,000	250	$12,500,000	$50,000,000
1,125	−0.10	−0.125	43,750,000	125	6,250,000	50,000,000
1,250	0	0	50,000,000	0	0	50,000,000
1,375	0.10	0.125	56,250,000	−125	−6,250,000	50,000,000
1,500	0.20	0.25	62,500,000	−250	−12,500,000	50,000,000

EXHIBIT 17.2 Value of the Hedged Stock Portfolio

Note that instead of locking in a future portfolio value, the portfolio manager could have alternatively bought put options to set up a portfolio insurance position that would have provided downside protection in case the market declined, but portfolio gains if the market increased. For this, however, the manager would have had to pay an insurance premium equal to the cost of the puts (see Exhibit 16.6).

In this example, we have a perfect hedge. Part of this is because we assumed the portfolio is well-diversified and the futures price and portfolio value are such that exactly 200 contracts are needed. In most cases, we would not expect such conditions to exist. Also, if the markets are efficient, we would not expect any difference to exist between locking in the June value of the portfolio with index futures and locking in the June portfolio value by selling the portfolio in January and investing the proceeds in a risk-free security for the period. Thus, if the portfolio manager actually knew he would be liquidating the portfolio in June, then selling 200 futures contracts in January and closing the contracts and liquidating the portfolio in June should be equivalent to selling the portfolio in January and investing the funds in risk-free security for the period. If this equivalence did not hold, an arbitrage opportunity would exist.

Long Hedge Example

A portfolio manager who was planning to invest a future inflow of cash in a stock portfolio could lock in the purchase price of the portfolio by going long in a stock index futures contract. For example, suppose in January, the portfolio manager in the above example was anticipating an inflow of cash in June and was planning to invest the cash in a stock portfolio with a beta of 1.25 and currently worth $50,000,000. If the June S&P 500 futures contract is at f_0 = 1,250, then the manager could hedge the purchase price by going long in 200 contracts:

$$N_f = \beta \frac{V_0}{f_0} = 1.25 \frac{\$50{,}000{,}000}{(1{,}250)(\$250)} = 200 \text{ contracts}$$

In June, the manager would buy the portfolio and receive or pay a cash settlement on the futures equal to the difference in the closing spot price on the S&P 500 (S_T) on the delivery day and the futures price (f_0): $S_T - f_0$. (The manager more likely would close the futures contract by going short in the expiring June contract trading near the spot price: $f_T = S_T$). With the long position, any higher portfolio cost as a result of stock market increase would be offset by a gain on the long futures position. On the other hand, any lower portfolio cost because of a market decrease would be negated by a loss on the long futures position. This is shown in Exhibit 17.3, where the long hedge position enables the manager to lock in a cost of $50 million for purchasing the portfolio and closing the futures position in June regardless of the S&P 500 value.

(1) S&P 500 Spot Index: S_T	(2) Proportional Change in the S&P 500: $(S_T - 1{,}250)/1{,}250$	(3) Proportional Change in Portfolio Value: $\beta g = 1.25(S_T - 1{,}250)/1{,}250$	(4) Portfolio Costs: \$50M $(1 + \beta g)$	(5) Long Futures Cash Flow per Contract: $S_T - f_0 = (S_T - 1{,}250)$	(6) Futures Cash Flow: 120(\$250) $(f_T - 1{,}250)$	(7) Portfolio Costs with Futures: (4) − (6)
1,000	−0.20	−0.25	\$37,500,000	−250	−\$12,500,000	\$50,000,000
1,125	−0.10	−0.125	43,750,000	−125	−6,250,000	50,000,000
1,250	0	0	50,000,000	0	0	50,000,000
1,375	0.10	0.125	56,250,000	125	6,250,000	50,000,000
1,500	0.20	0.25	62,500,000	250	12,500,000	50,000,000

EXHIBIT 17.3 Future Portfolio Purchase Hedged with Index Futures

(1) S&P 500 Spot Index: S_T = f_T	(2) Proportional Change: g = (S_T – 1,000)/1,000	(3) Futures Profit: (50) ($250) [$f_T$ – 1,000]	(4) Portfolio Value: $50M(1+$g$)	(5) Portfolio Value with Futures: (3)+(4)
800	−0.20	−$2,500,000	$40,000,000	$37,500,000
900	−0.10	−1,250,000	45,000,000	43,750,000
1,000	0	0	50,000,000	50,000,000
1,100	0.10	1,250,000	55,000,000	56,250,000
1,200	0.20	2,500,000	60,000,000	62,500,000

Portfolio Rates of Return and β = Δ Portfolio Rate/Δg +				
S&P 500 Spot Index: S_T	Portfolio Rate: [Col (4)/$50M]−1	β	Futures-Enhanced Portfolio Rate: [Col (5)/$50M] −1	β
800	−0.20	1	−0.25	1.25
900	−0.10	1	−0.125	1.25

(1) S&P 500 Spot Index: $S_T = f_T$	(2) Proportional Change: $g = (S_T - 1{,}000)/1{,}000$	(3) Futures Profit: (50)(\$250) $[f_T - 1{,}000]$	(4) Portfolio Value: \$50M$(1+g)$	(5) Portfolio Value with Futures: (3)+(4)
1,000	0	1	0	1.25
1,100	0.10	1	0.125	1.25
1,200	0.20	1	0.25	1.25

+

$$\text{Portfolio Rate} = \frac{\text{Portfolio Value}}{\$50{,}000{,}000} - 1$$

EXHIBIT 17.4 Market Timing

Note, as we examined in Chapter 16, the manager also could lock in a maximum portfolio cost (or cap) or the minimum number of shares purchased with the possibility of lower costs or more shares if the market declines by purchasing an index call option (see Exhibit 16.7).

Hedging Risk

The above examples represent perfect hedging cases in which certain revenues or costs can be locked in at a future date. In practice, perfect hedges are the exception and not the rule. There are three types of hedging risk that preclude one from obtaining a zero risk position: *quality risk*, *timing risk*, and *quantity risk.*

Quality risk exists when the commodity or asset being hedged is not identical to the one underlying the futures contract. In the above example, the portfolio with a beta of 1.25 was not identical to the S&P 500. The beta in the formula for N_f, in turn, adjusted the number of contracts to reduce the quality risk. Timing risk occurs when the delivery date on the futures contract does not coincide with the date the hedged asset needs to be purchased or sold. For example, timing risk would exist in our long hedging example if the manager needed to invest in a portfolio at the beginning of June instead of at the futures' expiration at the end of June. If the spot asset is purchased or sold at a date that differs from the expiration date on the futures contract, then the price on the futures (f_t) and the spot price (S_t) will not necessarily be equal. The difference between the futures and spot price is called the *basis* (B_t). The basis tends to narrow as expiration nears, converging to zero at expiration ($B_T = 0$). Prior to expiration, the basis can vary, with greater variability usually observed the longer the time is to expiration. Given this *basis risk*, the greater the time difference between buying or selling the hedged asset and the futures' expiration date, the less perfect the hedge. To minimize timing risk or basis risk, hedgers often select futures contracts that mature before the hedged asset is to be bought or sold but as close as possible to that date. For very distant horizon dates, however, hedgers sometimes follow a strategy known as *rolling the hedge forward.* This hedging strategy involves taking a futures position, then at expiration, closing the position and taking a new one. Finally, because of the standardization of futures contracts, futures hedge is subject to quantity risk. The presence of quality, timing, and quantity risk means that pricing risk cannot be eliminated totally by hedging with futures contracts. As a result, the objective in hedging is to try to minimize risk.

Portfolio Exposure—Market Timing

Instead of hedging a portfolio's value against market or systematic risk, suppose a manager wanted to change her portfolio's exposure to the market. For example, a stock portfolio manager who is very confident of a bull market may want to give her portfolio more exposure to the market by increasing the portfolio's beta. Changing a portfolio's beta to profit from an expected change in the market is referred to as *market timing*.

Without index futures (or options), the beta of a portfolio can be changed only by altering the portfolio's allocations of securities. With index futures, however, a manager can change the portfolio beta, β_0, to a new one, referred to as a target beta, β_{TR}, simply by buying or selling futures contracts. The number of futures contracts needed to move the portfolio beta from β_0 to β_{TR} can be determined using the price-sensitivity model in which:[3]

$$N_f = \frac{V_0}{f_0}(\beta_{TR} - \beta_0)$$

where:

- if $\beta_{TR} > \beta_0$, long in futures
- if $\beta_{TR} < \beta_0$, short in futures

Market-Timing Example

Consider the case of a stock portfolio manager who in September is confident the market will increase over the next three months, and as a result, wants to change her portfolio's beta from its current value of $\beta_0 = 1$ to $\beta_{TR} = 1.25$. Suppose the portfolio currently is worth \$50 million, the spot S&P 500 index is at

1,000, and the price on the December S&P 500 futures contract is 1,000. To adjust the portfolio beta from 1 to 1.25, the manager would need to buy N_f = 50 December S&P 500 index futures:

$$N_f = \frac{V_0}{f_0}(\beta_{TR} - \beta_0) = \frac{\$50{,}000{,}000}{(1{,}000)(\$250)}(1.25 - 1) = 50$$

As shown in Exhibit 17.4, if the market increases, then the manager earns higher rates of return from the futures-adjusted portfolio than from the unadjusted portfolio. If the market declines, however, she incurs greater losses with the adjusted portfolio than with the unadjusted one. For example, if the market increases by 10 percent, the portfolio increases from \$50M to \$55M (a 10 percent increase, reflecting a β = 1) and the long futures position generates an addition cash flow of \$1.25M, increasing the portfolio value to \$56.25 million (a 12.5 percent increase, reflecting a β = 1.25). In contrast, if the market decreases by 10 percent, then the portfolio decreases from \$50M to \$45M (a 10 percent decrease, reflecting a β = 1) and the long futures position loses \$1.25M, decreasing the portfolio value to \$43.75M (a 12.5 percent decrease, reflecting a β = 1.25). Thus, the futures-enhanced portfolio is consistent with the characteristics of a portfolio with a β of 1.25.

OSA: HEDGING PORTFOLIOS USING OSA

On the OSA screen, you can import a portfolio and then use the “Hedge” tab to determine the number of index futures contracts needed to hedge your portfolio. The number of contracts is based on the beta of the portfolio.

To evaluate a portfolio insurance position for a portfolio you created in PRTU:

- OSA <Enter>.
- From the “Portfolio” dropdown, select a portfolio.
- Click gray “Hedge” tab.
- On the Hedge screen, select index (e.g., SPX) and ticker (e.g., SPZ3 for December S&P 500 futures).
- The right corner box on the Hedge screen shows the portfolio value, beta, future price, contract size, and number of contracts: $N_f = \beta V/(f_0)250$.

See Bloomberg Web Exhibit 17.2.

Pricing Futures and Forward Contracts: Carrying-Cost Model

As a derivative security, the price on a futures contract depends on the price of the underlying asset. Like options, the relation between futures and spot prices is governed by arbitrage. The arbitrage relation governing the equilibrium futures and forward prices is referred to as the *carrying-cost model*. This model determines the equilibrium futures or forward price by solving for that price that is equal to the cost of carrying the underlying asset for the time period from the present to the expiration on the contract (i.e., the net cost of buying the underlying asset and holding it for the period). If the futures or forward price does not equal the cost of carrying the underlying asset, then an arbitrage opportunity exists by taking a position in the futures or forward contract and an opposite position in the underlying asset. Thus, in the absence of arbitrage, the price on the futures or forward contract is equal to the cost of carrying the asset.

Commodity Carrying-Cost Model

The carrying-cost model for a typical commodity forward contract is:

$$F_0 = S_0(1 + R_f)^T + (K)(T) + TRC$$

where:

- K = storage costs per unit of the commodity per period
- TRC = transportation costs
- T = time to delivery as a proportion of a year

To illustrate, suppose in June the spot price of a bushel of wheat is $2.00, the annual storage cost is $0.30 per/bushel, the risk-free rate is 8 percent, and the cost of transporting wheat from the destination point specified on the forward contract to a local grain elevator, or vice versa, is $0.01/bu. By the cost of carry model, the equilibrium price of a forward contract on September wheat (expiration of T = 0.25) would be $2.124/bu:

$$F_0 = (\$2.00/\text{bu})(1.08)^{0.25} + (\$0.30/\text{bu})(0.25) + \$0.01/\text{bu} = \$2.124/\text{bu}$$

If the actual futures price is $2.16, an arbitrageur would:

1. Take a short position in the forward contract: agree to sell a September bushel of wheat for $2.16.
2. Borrow $2.00 at 8 percent interest.
3. Use the loan proceeds to buy a bushel of wheat for $2.00, and then store it for three months.
4. At expiration, the arbitrageur would transport the wheat from the grain elevator to the specified destination point on the forward contract for $0.01/bu.
5. Pay the financing costs of $2.0388/bu and the storage costs of ($0.30/bu)(0.25) = $0.075/bu.
6. Sell the bushel of wheat on the forward contract at $2.16/bu.

From this cash-and-carry strategy, the arbitrageur would earn a riskless return of $0.036/bu.[4]

Stock Index Futures Pricing: Carrying-Cost Model

The equilibrium futures price on a stock index futures contract is equal to the net costs of carrying a spot index portfolio or proxy portfolio to expiration at time *T*. For the case of a discrete dividend payment on the portfolio worth D_T at expiration, the equilibrium price is:

$$f_0^* = S_0(1 + R^A)^T - D_T$$

where:

- S_0 = current spot index value
- D_T = value of the stock index dividends at time *T*

If the equilibrium condition does not hold, an arbitrage opportunity will exist by taking a position in the spot portfolio, such as index ETF, and an opposite one in the futures contract. For example, if the market price on the futures contract (f_0^M) exceeds the equilibrium price, then an arbitrageur could earn a riskless profit of $f_0^M - f_0^*$ with an *index arbitrage* strategy in which she borrows S_0 dollars at the risk-free rate of

R^A, buys the spot index portfolio or ETF for S_0, and locks in the selling price on the portfolio at time T by going short in the index futures at f_0^M.

Options on Futures Contracts

Option contracts on stocks, debt securities, foreign currency, and indexes are sometimes referred to as *spot options* or options on actuals. This reference is to distinguish them from *options on futures* contracts (also called *options on futures*, *futures options*, and *commodity options*). A futures option gives the holder the right to take a position in a futures contract.

A call option on a futures contract gives the holder the right to take a long position in the underlying futures contract when she exercises and requires the writer to take the corresponding short position in the futures. Upon exercise, the holder of a futures call option in effect takes a long position in the futures contract at the *current* futures price and the writer takes the short position and pays the holder via the clearinghouse the difference between the current futures price and the exercise price. In contrast, a put option on a futures option entitles the holder to take a short futures position and the writer the long position. Thus, whenever the put holder exercises, he in effect takes a short futures position at the current futures price, and the writer takes the long position and pays the holder via the clearinghouse the difference between the exercise price and the current futures price. Like all option positions, the futures option buyer pays an option premium for the right to exercise, and the writer, in turn, receives a credit when he sells the option and is subject to initial and maintenance margin requirements on the option position.

In practice, when the holder of a futures call option exercises, the futures clearinghouse will establish for the exercising option holder a long futures position at the futures price equal to the exercise price and a short futures position for the assigned writer. Once this is done, margins on both positions will be required, and the position will be marked to market at the current settlement price on the futures. When the positions are marked to market, then the exercising call holder's margin account on his long position will be equal to the difference between the futures price and the exercise price, $f_t - X$, while the assigned writer will have to deposit funds or monies worth nearly $f_t - X$ to satisfy her maintenance margin on her short futures position. Thus, when a futures call is exercised, the holder takes a long position at f_t with a margin account worth $f_t - X$; if he were to immediately close the futures, he would receive cash worth $f_t - X$ from the clearinghouse. The assigned writer, in turn, is assigned a short position at f_t and must deposit $f_t - X$ to meet her margin. If the futures option is a put, then the same procedure applies, except the holder takes a short position at f_t (when the exercised position is marked to market), with a margin account worth $X - f_t$, and the writer is assigned a long position at f_t and must deposit $X - f_t$ to meet her margin.

A spot option on a security and futures options on the same security are equivalent if the options and the futures contracts expire at the same time, the carrying-costs model holds, and the options are European. (In contrast, spot and futures options will differ to the extent that these conditions do not hold.) There are, however, several factors that serve to differentiate the spot and futures options. First, since most futures contracts are relatively more liquid than their corresponding spot security, it is usually easier to form hedging or arbitrage strategies with futures options than with spot options. Second, many futures options often are easier to exercise than their corresponding spot. For example, to exercise an option on a foreign currency futures contract, one simply assumes the futures position; exercising a spot foreign currency spot option, however, requires an actual purchase or delivery. Finally, most futures options are traded on the same exchange as their underlying futures contract, whereas most spot options are traded on exchanges different from their underlying securities. This, in turn, makes it easier for futures options traders to implement arbitrage and hedging strategies than it is for spot options traders.

Stock Index Futures Options

Some of the characteristics of futures options can be seen by examining the profit relationships for the fundamental strategies formed with these options. Exhibits 17.5 and 17.6 show the profit and futures price relationship at expiration for four fundamental option strategies using call and put options on the S&P 500 futures contract. Both the call and the put have an exercise price of 1,250 times a $250 multiple and a premium of 10 times $250, and it is assumed the futures options expire at the same time as the futures contract.

Exhibit 17.5 shows the profit and futures price relationship at expiration for the call purchase strategy. The numbers reflect a case in which the holder exercises the call at expiration, if profitable, when the spot price is equal to the price on the expiring futures contract. For example, at $S_T = f_T = 1{,}270$, the holder of the 1,250 futures call would receive a cash flow of $5,000 and a profit of $2,500. That is, upon exercising, the holder would assume a long position in the expiring S&P 500 futures at 1,270, which she subsequently would close by taking an offsetting short futures position at 1,270, and the holder would receive $5,000 from the assigned writer: $(f_T - X)\$250 = (1{,}270 - 1{,}250)\$250 = \$5{,}000$. The opposite profit and futures price relation is attained for a naked call write position (lower graph). In this case, if the index is at 1,250 or less, the writer of a 1,250 SP 500 futures call would earn the premium of $2,500, and if $f_T > 250$, he, upon assignment, would have to pay the difference between f_T and X and would have to assume a short position at f_T, which he would close with an offsetting long position.

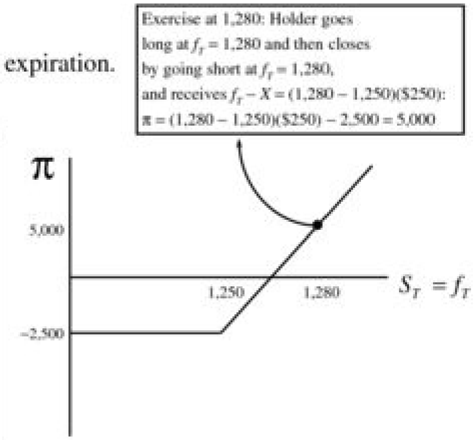
a. Long Position on S&P 500 Futures Call Option

Call on S&P 500 Futures:

- $X = 1{,}250$, Multiplier = \$250
- $C = 10(\$250) = \$2{,}500$
- Futures and option futures have same expiration.

$S_T = f_T$	π_C
1,230	–2,500
1,240	–2,500
1,250	–2,500
1,260	0
1,270	2,500
1,280	5,000

$\pi_C = \text{Max}\,(f_T - 1{,}250, 0)(\$250) - 2{,}500$



b. Short Position on S&P 500 Futures Call Option

Call on S&P 500 Futures:

- $X = 1{,}250$, Multiplier = \$250
- $C = 10(\$250) = \$2{,}500$
- Futures and option futures have same expiration.

$S_T = f_T$	π_C
1,230	2,500
1,240	2,500
1,250	2,500
1,260	0
1,270	–2,500
1,280	–5,000

$\pi_C = -\text{Max}\,(f_T - 1{,}250, 0)\,(\$250) + 2{,}500$

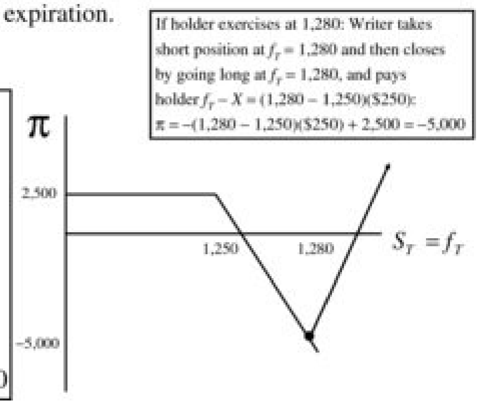


EXHIBIT 17.5 Fundamental Futures Call Options Strategies

Exhibit 17.6 shows the long and short put positions. In the case of a put purchase, if the holder exercises when f_T is less than X, then she will receive $X - f_T$ and a short futures position that she can offset. For example, if $S_T = f_T = 1{,}230$ at expiration, then the put holder upon exercising would receive $5,000 [(1,250 – 1,230)($250)] from the put writer. Her short position then would be closed by taking a long position in the S&P 500 futures contract. The put writer's position would be just the opposite.

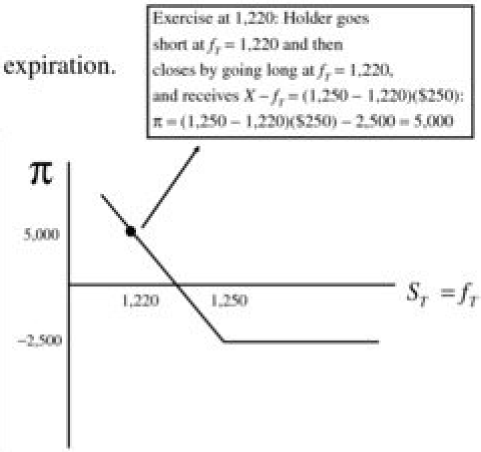
c. Long Position on S&P 500 Futures Put Option

Put on S&P 500 Futures:

- $X = 1{,}250$, Multiplier = \$250
- $P = 10(\$250) = \$2{,}500$
- Futures and option futures have same expiration.

$S_T = f_T$	π_P
1,220	5,000
1,230	2,500
1,240	0
1,250	−2,500
1,260	−2,500
1,270	−2,500

$\pi_P = \text{Max}(1{,}250 - f_T, 0)(\$250) - 2{,}500$



d. Short Position on S&P 500 Futures Put Option

Put on S&P 500 Futures:

- $X = 1{,}250$, Multiplier = \$250
- $P = 10(\$250) = \$2{,}500$
- Futures and option futures have same expiration.

$S_T = f_T$	π_P
1,220	−5,000
1,230	−2,500
1,240	0
1,250	2,500
1,260	2,500
1,270	2,500

$\pi_P = -\text{Max}(1{,}250 - f_T, 0)(\$250) + 2{,}500$

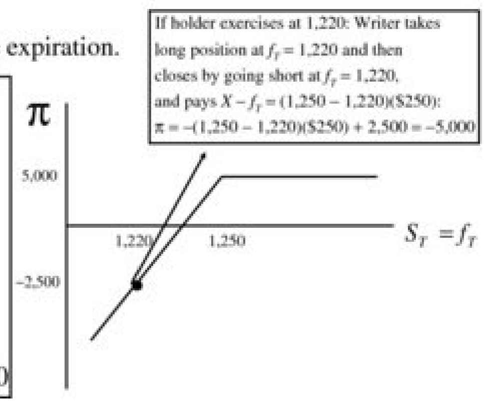


EXHIBIT 17.6 Fundamental Futures Put Options Strategies

BLOOMBERG FUTURES OPTIONS SCREENS

To Access information on futures options, do the following:

- CTM <Enter>; click "Exchange." Example: click "Chicago Mercantile Exchange," from "Category" column, select "Equity Index"; from "Type" column select futures; from "Options" column, select yes.
- Right click to bring up menu to select description (DES), contract table on futures (CT), or options on futures options (OMON).
- You can select a futures option from OMON and then bring up its menu screen: Ticker <Comdty> (e.g., SPG4C 1780 <Comdty>). The futures options screen includes options scenario analysis (OSA) and option valuation (OVL) screens.

Alternative:

- Enter: Ticker <Comdty> to bring up futures menu; Example: SPA <Comdty> will bring up the S&P 500 futures contracts.
- On the futures menus, bring up EXS screen to find futures expirations and their tickers for futures contracts of interest (e.g., SPM4 for March 2014 S&P 500 futures).
- Bring up the futures screen: Ticker <Comdty> (e.g., SPM4 <Comdty).
- On futures menu screen, bring up the OSA screen (OSA <Enter>.
- On the futures OSA screen, select "Add Listed Options" from the red "Positions" tab; select futures options; click "Add Options" tab.
- On the OSA main screen, you can analyze positions using the "Scenario Chart" tab.

Other option screens on the futures menu are as follows:

- OTD: Description of Futures Option.
- OSL: Option Strike List.

- OMON: Option Monitor.
- OMST: Most Active Options.
- OVL: Option valuation.

See Bloomberg Web Exhibit 17.3.

Conclusion

In this chapter, we have provided an overview of futures and forward contracts. These derivative securities are very similar to options. Like options, they can be used as speculative tools to profit from changes in asset prices and as hedging tools to minimize price risk. Also like options, futures contracts are traded on organized exchanges that have many of the same trading rules and procedures that option exchanges have. Finally, futures and forward contracts, like options, are derivative securities, and as such, their prices are determined by arbitrage forces.

The fundamental difference between the contracts is that options give holders a right, whereas futures or forward contract holders have an obligation. As a result, potential profits and losses on pure speculative futures positions are virtually unlimited compared to limited profit and loss potentials on fundamental speculative option positions. Hedging strategies with futures, while capable of eliminating downside risk, can also impact the upside potential as compared to option hedging that can provide minimum and maximum limits. Futures and options, as well as other derivative like swaps, have become a basic financial engineering tool to apply to a variety of financial problems.

We, of course, have not exhausted all derivative securities, just as we have not covered all the strategies, uses, markets, and pricing of equity securities. What we hope we have done here and in these last two chapters, however, is to develop a foundation for the understanding of derivative products and their important applications in equity management. To this extent, we also hope our odyssey into the world of stock, stock portfolios, and equity derivatives, along with our exploration into the depth and breadth of the Bloomberg system, has established a foundation and methodology for understanding the markets and uses of equity securities.

Web Site Information

- Information on the CBOE: www.cboe.com.
- Information on the Chicago Mercantile Exchange: http://www.cmegroup.com.
- U.S. Commodity Futures Trading Commission: http://www.cftc.gov.

Notes

1. Clearinghouse members are also required to maintain a margin account with the clearinghouse. This is known as a *clearing margin*.

2. Several non-U.S. exchanges offer futures trading on individual stocks, including U.S. stocks. Until 2000, U.S. security laws prohibited such trading in the United States. This law, however, was changed in 2000, resulting in proposals for such trading.

3. A portfolio's exposure to the market also can be changed by buying index call or put options. The number of options needed to change the beta is:

$$N = \frac{V_0}{X}(\beta_{TR} - \beta_0)$$

where:

if $\beta_{TR} > \beta_0$, long in index calls

if $\beta_{TR} < \beta_0$, long in index puts

---

4. **For many commodities, the reverse cash-and-carry arbitrage strategy does not apply. In such cases, the equilibrium condition for the forward contract needs to be specified as an inequality: $F_0 < S_0(1 + R_f)^T + (K)(T) + TRC$.**

Selected References

Figlewski, S. 1984. Hedging performance and basis risk in stock index futures. *Journal of Finance* 39 (July): 657–669.

Figlewski, S., and S. Kin. 1982. Portfolio management with stock index futures. *Financial Analysts Journal* 38 (January–February): 52–60.

Hardy, C. 1940. *Risk and Risk Bearing*. Chicago: University of Chicago Press: 67–69.

Hardy, C., and L. Lyon. 1923. The theory of hedging. *Journal of Political Economy* 31: 271–287.

Hull, J. 2005. *Options, Futures and Other Derivative Securities*, 6th ed. Englewood Cliffs, N.J.: Prentice Hall: Chapter 23.

Johnson, R. S. 2009. *Introduction to Derivatives: Options, Futures, and Swaps*. New York: Oxford University Press: Chapter 15.

Modest, D., and M. Sundaresan. 1983. The relationship between spot and futures prices in stock index futures markets: Some preliminary evidence." *Journal of Futures Markets* 3: 15–41.

Ramaswany, K., and M. Sundaresan. 1985. The valuation of options on futures contracts. *Journal of Finance* 60 (December): 1319–1340.

Shastri, K., and K. Tandon. 1986. Options on futures contracts: A comparison of European and American pricing models. *The Journal of Futures Markets* 6 (Winter): 593–618.

Whaley, R. 1986. Valuation of American futures options: Theory and tests." *The Journal of Finance* 41 (March): 127–150.

Bloomberg Exercises

1. Exchange-listed commodities can be found by accessing the CTM screen: CTM <Enter>. Contracts are listed by category, exchanges, and region. For example, to find a stock index on the Chicago Mercantile Exchange (CME), use the CTM “Exchange” screen and click “Equity Index” from the drop-down menu in the “Category” column; to find a commodity contract on the Chicago Board of Trade (CBT), use the CBT “Exchange” screen and click commodity type from the dropdown menu in the “Category” column. Using the CTM screen, find the tickers on a futures contract of interest and analyze it using screens from the contract's menu screen (Ticker <Comdty>). Screens to consider are Description (DES), Contract Table (CT), Intraday Graph (GIP), Expiration Schedule (EXS), and Price Graph (GP).
2. Select a portfolio with a market value of at least $1.5 million that you have created in PRTU. Using the OSA screen, determine the number of futures contracts needed to hedge your portfolio. For a guide, see Bloomberg box: “OSA: Hedging Portfolios Using OSA.”
3. Select some put and call options on an S&P 500 futures contract using the futures contracts OSA screen:
    1. Go to futures menu screen (SPA <Comdty>).
    2. Look for contracts and tickers on the EXS screen.
    3. Bring up the futures contract menu screen (ticker <Comdty> or ticker <Index>).
    4. Bring up the OSA screen (OSA <Enter>).
    5. Use the “Position” tab on the OSA screen for the futures contract to add put and call options on the futures contract.

       Using OSA “Scenario Chart” tab, analyze a number of futures and futures options positions.

      1. Long futures position.
      2. Short futures position.
      3. Futures call purchase.
      4. Futures put purchase.
      5. Covered call write (short futures call and long futures).
      6. Covered put write (short futures put and short futures).
      7. Futures insurance (long futures contract and long futures put).
      8. Long straddle.
      9. Short straddle.
4. Select some put and call options on futures other than the S&P using the futures contracts OSA screen:
   1. Go to CTM screen to find futures and futures options.
   2. Go to futures menu screen (ticker <Comdty>).
   3. Look for contracts and tickers on the EXS screen.
   4. Bring up futures contract (ticker <Comdty> or ticker <Index>).
   5. Bring up the OSA screen (OSA <Enter>).
   6. Use the “Position” tab on the OSA screen for the futures contract to add put and call options on the futures contract

      Using OSA “Scenario Chart” tab, analyze a number of futures and futures options positions.
      1. Long futures position.
      2. Short futures position.
      3. Futures call purchase.
      4. Futures put purchase.
      5. Covered call write (short futures call and long futures).
      6. Covered put write (short futures put and short futures).
      7. Futures insurance (long futures contract and long futures put).

8. Long straddle.
9. Short straddle.