CHAPTER 14

Stock Options

Options have fascinated investors for centuries. The option concept is simple. Instead of buying stock shares today, you buy an option to buy the stock at a later date at a price specified in the option contract. You are not obligated to exercise the option, however, unless doing so benefits you. Moreover, the most you can lose is the original price of the option, which is normally only a fraction of the stock price. Sounds good, doesn't it?

Options on common stocks have traded in financial markets for about as long as have common stocks. However, it was not until 1973, when the Chicago Board Options Exchange was established, that options trading became a large and important part of the financial landscape. Since then, the success of options trading has been phenomenal.

Much of the success of options trading is attributable to the tremendous flexibility that options offer investors in designing investment strategies. For example, options can be used to reduce risk through hedging strategies or to increase risk through speculative strategies. As a result, when properly understood and applied, options are appealing both to conservative investors and to aggressive speculators.

In this chapter, we discuss options generally, but our primary focus is on options on individual common stocks. However, later in the chapter we will also discuss options on stock market indexes, which are options on portfolios of common stocks. We begin by reviewing some of the ideas we touched on in Chapter 3 where we very briefly discussed options.

(*marg. def.* **derivative security** Security whose value is derived from the value of another security. Options are a type of derivative security.)

(*marg. def.* **call option** On common stock, grants the holder the right, but not the obligation, to buy the underlying stock at a given **strike price**.)

(*marg. def.* **put option** On common stock, grants the holder the right, but not the obligation, to sell the underlying stock at a given **strike price**.)

14.1 Options on Common Stocks

Option Basics

As we have discussed, options on common stock are a type of **derivative security**, because the value of a stock option is "derived" from the value of the underlying common stock. For example, the value of an option to buy or sell IBM stock is derived from the value of IBM stock. However, the relationship between the value of a particular stock option and the value of the underlying stock depends on the specific type of option.

Recall that there are two basic option types: **call options** and **put options**. Call options are options to buy, and put options are options to sell. Thus, a call option on IBM stock is an option to buy IBM shares, and a put option on IBM stock is an option to sell IBM shares. More specifically, a call option on common stock grants the holder the right, but not the obligation, to buy the underlying stock at a given **strike price** before the option expiration date. Similarly, a put option on common stock grants the holder the right, but not the obligation, to sell the underlying stock at a given strike price before the option expiration date. The strike price, also called the *exercise price*, is the price at which stock shares are bought or sold to fulfill the obligations of the option contract.

(*marg. def.* **strike price** Price specified in an option contract that the holder pays to buy shares (in the case of call options) or receives to sell shares (in the case of put options) if the option is exercised. Also called the *striking* or *exercise price*.)

Options are contracts, and, in practice, option contracts are standardized to facilitate convenience in trading and price reporting. Standardized stock options have a contract size of 100 shares of common stock per option contract. This means that a single call option contract involves an option to buy 100 shares of stock. Likewise, a single put option contract involves an option to sell 100 shares of stock.

Because options are contracts, an understanding of stock options requires that we know the specific contract terms. In general, options on common stock must stipulate at least the following six contract terms:

1. the identity of the underlying stock,
2. the strike price, also called the striking or exercise price,
3. the option expiration date, also called the option maturity,
4. the option contract size,
5. the option exercise style,
6. the delivery or settlement procedure.

First, a stock option contract requires that the specific stock issue be clearly identified. While this may seem to be stating the obvious, in financial transactions it is important that the “obvious” is in fact clearly and unambiguously understood by all concerned parties.

Second, the strike price, also called the exercise price, must be stipulated. The strike price is quite important, since the strike price is the price that an option holder will pay (in the case of a call option) or receive (in the case of put a option) if the option is exercised.

Third, the size of the contract must be specified. As stated earlier, the standard contract size for stock options is 100 stock shares per option.

The fourth contract term that must be stated is the option expiration date. An option cannot be exercised after its expiration date. If an option is unexercised and its expiration date has passed, the option becomes worthless.

Fifth, the option's exercise style determines when the option can be exercised. There are two basic exercise styles: American and European. **American options** can be exercised any time before option expiration, but **European options** can be exercised only on the day before option expiration. Options on individual stocks are normally American style, and stock index options are usually European style.

(*marg. def.* **American option** An option that can be exercised any time before expiration.)

(*marg. def.* **European option** An option that can be exercised only on the day before option expiration.)

Finally, in the event that a stock option is exercised, the settlement process must be stipulated. For stock options, standard settlement requires delivery of the underlying stock shares several business days after a notice of exercise is made by the option holder.

Stock options are traded in financial markets in a manner similar to the way that common stocks are traded. For example, there are organized options exchanges, and there are over-the-counter (OTC) options markets. The largest volume of stock options trading in the United States takes place at the Chicago Board Options Exchange (CBOE). However, stock options are also actively traded at the Philadelphia Stock Exchange (PHLX), the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), and the Pacific Stock Exchange (PSE). Like a stock exchange, or, for that matter, any securities exchange, an options exchange is a marketplace where customer buy orders and sell orders are matched up with each other.

Option Price Quotes

Current prices for many stock options traded at the major options exchanges are reported each day in the *Wall Street Journal*. However, the *Wall Street Journal* reports prices for only the most heavily traded stock options. Figure 14.1 reproduces a section of the "LISTED OPTIONS QUOTATIONS" page in the *Wall Street Journal*

Figure 14.1 about here

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In Figure 14.1, the table entitled "MOST ACTIVE CONTRACTS" reports data on selected option contracts with the highest trading volumes in the previous day's options trading. Reference information immediately above this table is useful for interpreting data in the options listings. In the table itself, the first three columns report the name of the option's underlying stock, the expiration month, and the strike price for the option. A "p" following the strike price indicates a put option; otherwise, it is a call option. The next two columns report volume, measured as the number of contracts traded on the previous day, and the exchange where that particular option contract is traded.

The column labeled "Last" reports the contract price for the last trade of the previous day, and the column labeled "Net Change" reports the price change from the last price recorded a day earlier. The final column reports open interest, the total number of contracts outstanding. Notice that all option contracts listed in this table are sorted by trading volume.

The rest of the "LISTED OPTIONS QUOTATIONS" page reports options trading data grouped by the underlying stock. For each underlying stock with options listed in Figure 14.1, the first column under a stock name is simply a repeated statement of the stock's current price. The

second column states strike prices of the various options available for each stock. Notice that the range of available strike prices for stock options typically brackets a current stock price.

The third column states the expiration months of each available option contract. By convention, standardized stock options expire on the Saturday following the third Friday of their expiration month. Because of this convention, the exact date that an option expires can be known exactly by referring to a calendar to identify the third Friday of its expiration month.

These first three contract terms—the identity of the underlying stock, the striking price, and the expiration month—will not change during the life of the option. However, since the price of a stock option depends on the price of the underlying stock, the price of an option changes as the stock price changes.

Option prices are reported in columns 5 and 7 in the stock options listing displayed in Figure 14.1. Column 5 gives call option prices, and column 7 gives put option prices. Option prices are stated on a per-share basis, but the actual price of an option contract is 100 times the per-share price. This is because each option contract represents an option on 100 shares of stock. Fractional contracts for, say, 50 shares, are not normally available.

In Figure 14.1, trading volume for each contract is reported in columns 4 and 6. Column 4 states the number of call option contracts traded for each available strike-maturity combination, while column 6 states the number of put option contracts traded for each strike-maturity combination.

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14.1a What is a call option? What is a put option?

14.1b What are the six basic contract terms that an options contract must specify?

14.2 Why Options?

As a stock market investor, a basic question you might ask is: “Why buy stock options instead of shares of stock directly?” Good question! To answer it properly, we need to compare the possible outcomes from two investment strategies. The first investment strategy entails simply buying stock. The second strategy involves buying a call option that allows the holder to buy stock any time before option expiration.

For example, suppose you buy 100 shares of IBM stock at a price of $90 per share, representing an investment of $9,000. Afterwards, three things could happen: the stock price could go up, go down, or remain the same. If the stock price goes up, you make money; if it goes down, you lose money. Of course, if the stock price remains the same, you break even.

Now, consider the alternative strategy of buying a call option with a strike price of $90 expiring in three months at a per-share price of $5. This corresponds to a contract price of $500 since the standard option contract size is 100 shares. The first thing to notice about this strategy is that you have invested only $500, and therefore the most that you can lose is only $500.

To compare the two investment strategies just described, let's examine three possible cases for IBM’s stock price at the close of trading on the third Friday of the option's expiration month. In case 1, the stock price goes up to $100. In case 2, the stock price goes down to $80. In case 3, the stock price remains the same at $90.

Case 1. If the stock price goes up to $100, and you originally bought 100 shares at $90 dollars per share, then your profit is 100×($100 - $90) = $1,000. As a percentage of your original investment amount of $9,000, this represents a return on investment of $1,000 / $9,000 = 11.1%.

Alternatively, if you originally bought the call option, you can exercise the option and buy 100 shares at the strike price of $90 and sell the stock at the $100 market price. After accounting for the original cost of the option contract, your profit is 100×($100 - $90) - $500 = $500. As a percentage of your original investment of $500, this represents a return on investment of $500 / $500 = 100%.

Case 2. If the stock price goes down to $80, and you originally bought 100 shares at $90 dollars per share, then your loss is 100×($80 - $90) = -$1,000. As a percentage of your original investment, this represents a return of -$1,000 / $9,000 = -11.1%.

If instead you originally bought the call option, it would not pay to exercise the option and it would expire worthless. You would then realize a total loss of your $500 investment and your return is -100 percent.

Case 3. If the stock price remains the same at $90, and you bought 100 shares, you break even and your return is zero percent.

However, if you bought the call option, it would not pay to exercise the option and it would expire worthless. Once again, you would lose your entire $500 investment.

As these three cases illustrate, the outcomes of the two investment strategies differ significantly, depending on subsequent stock price changes. Whether one strategy is preferred over another is a matter for each individual investor to decide. What is important is the fact that options offer an alternative means of formulating investment strategies.

Example 14.1 Stock returns Suppose you bought 100 shares of stock at $50 per share. If the stock price goes up to $60 per share, what is the percentage return on your investment? If, instead, the stock price falls to $40 per share, what is the percentage return on your investment?

If the stock goes to $60 per share, you make $10/$50 = 20%. If it falls to $40, you lose $10/$50 = 20%.

Example 14.2 Call option returns In Example 14.1 just above, suppose that you bought one call option contract for $200. The strike price is $50. If the stock price is $60 just before the option expires, should you exercise the option? If you exercise the option, what is the percentage return on your investment? If you don't exercise the option, what is the percentage return on your investment?

If the stock price is $60, you should definitely exercise. If you do, you will make $10 per share, or $1,000, from exercising. Once we deduct the $200 original cost of the option, your net profit is $800. Your percentage return is $800/$200 = 400%. If you don't exercise, you lose your entire $200 investment, so your loss is 100 percent.

Example 14.3 More call option returns In Example 14.2, if the stock price is $40 just before the option expires, should you exercise the option? If you exercise the option, what is the percentage return on your investment? If you don't exercise the option, what is the percentage return on your investment?

If the stock price is $40, you shouldn't exercise since, by exercising, you will be paying $50 per share. If you did exercise, you would lose $10 per share, or $1,000, plus the $200 cost of the option, or $1,200 total. This would amount to a -$1,200/$200 = -600% loss! If you don't exercise, you lose the $200 you invested, for a loss of 100 percent.

Of course, we can also calculate percentage gains and losses from a put option purchase. Here we make money if the stock price declines. So, suppose you buy a put option with a strike price of $20 and the premium is $.50. If you exercise your put when the stock price is $18, what is your percentage gain?

You make $2 per share since you are selling at $20 when the stock is worth $18. Your put contract cost $50, so your net profit is $200 - $50 = $150. As a percentage of your original $50 investment, you made $150 / $50 = 300%.

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14.2a If you buy 100 shares of stock at $10 and sell out at $12, what is your percentage return?

14.2b If you buy one call contract with a strike of $10 for $100 and exercise it when the stock is selling for $12, what is your percentage return?

14.3 Option Payoffs and Profits

Options are appealing because they offer investors a wide variety of investment strategies. In fact, there is essentially no limit to the number of different investment strategies available using options. However, fortunately for us, only a small number of basic strategies are available and more complicated strategies are built from these. We discuss the payoffs from basic strategies in this section and the following section.

Option Writing

Thus far, we have discussed options from the standpoint of the buyer only. However, options are contracts, and every contract must link at least two parties. The two parties to an option contract are the buyer and the seller. The seller of an option is called the "writer," and the act of selling an option is referred to as **option writing**.

(*marg. def.* **option writing**. Taking the seller's side of an option contract.)

By buying an option you buy the right, but not the obligation, to exercise the option before the option's expiration date. By selling or writing an option you take the seller's side of the option contract. Option writing involves receiving the option price and, in exchange, assuming the obligation to satisfy the buyer's exercise rights if the option is exercised.

(*marg. def.* **call writer** One who has the obligation to sell stock at the option's strike price if the option is exercised.)

(*marg. def.* **put writer** One who has the obligation to buy stock at the option's strike price if the option is exercised.)

For example, a **call writer** is obligated to sell stock at the option's strike price if the buyer decides to exercise the call option. Similarly, a **put writer** is obligated to buy stock at the option's strike price if the buyer decides to exercise the put option.

Option Payoffs

It is useful to think about option investment strategies in terms of their initial cash flows and terminal cash flows. The initial cash flow of an option is the price of the option, also called the option *premium*. To the option buyer, the option price (or premium) is a cash outflow. To the option writer, the option price (or premium) is a cash inflow. The terminal cash flow of an option is the option's payoff that could be realized from the exercise privilege. To the option buyer, a payoff entails a cash inflow. To the writer, a payoff entails a cash outflow.

For example, suppose the current price of IBM stock is $80 per share. You buy a call option on IBM with a strike price of $80. The premium is $4 per share. Thus the initial cash flow is -$400 for you and +$400 for the option writer. What are the terminal cash flows for you and the option writer if IBM has a price of $90 when the option expires? What are the terminal cash flows if IBM has a price of $70 when the option expires?

If IBM is at $90, then you experience a cash inflow of $10 per share, whereas the writer experiences an outflow of $10 per share. If IBM is at $70, you both have a zero cash flow when the option expires because it is worthless. Notice that in both cases the buyer and the seller have the same

cash flows, just with opposite signs. This shows that options are a "zero-sum game," meaning that any gains to the buyer must come at the expense of the seller and vice versa.

Payoff Diagrams

When investors buy options, the price that they are willing to pay depends on their assessment of the likely payoffs (cash inflows) from the exercise privilege. Likewise, when investors write options, an acceptable selling price depends on their assessment of the likely payoffs (cash outflows) resulting from the buyers' exercise privilege. Given this, a general understanding of option payoffs is critical for understanding how option prices are determined.

A payoff diagram is a very useful graphical device for understanding option payoffs. The payoffs from buying a call option and the payoffs from writing a call option are seen in the payoff diagram in Figure 14.2. The vertical axis of Figure 14.2 measures option payoffs, and the horizontal axis measures the possible stock prices on the option expiration date. These examples assume that the call option has a strike price of $50 and that the option will be exercised only on its expiration date.

Figure 14.2 about here

In Figure 14.2, notice that the call option payoffs are zero for all stock prices below the $50 strike price. This is because the call option holder will not exercise the option to buy stock at the $50 strike price when the stock is available in the stock market at a lower price. In this case, the option expires worthless.

In contrast, if the stock price is higher than the $50 strike price, the call option payoff is equal to the difference between the market price of the stock and the strike price of the option. For example, if the stock price is $60, the call option payoff is equal to $10, which is the difference between the $60 stock price and the $50 strike price. This payoff is a cash inflow to the buyer, because the option buyer can buy the stock at the $50 strike price and sell the stock at the $60 market price. However, this payoff is a cash outflow to the writer, because the option writer must sell the stock at the $50 strike price when the stock's market price is $60.

Putting it all together, the distinctive “hockey-stick” shape of the option payoffs shows that the payoff is zero if the stock price is below the strike price. Above the strike price, however, the buyer of the option gains $1 for every $1 increase in the stock price. Of course, as shown, the option writer loses $1 for every $1 increase in the stock price above the strike price.

Figure 14.3 is an example of a payoff diagram illustrating the payoffs from buying a put option and from writing a put option. As with our call option payoffs, the vertical axis measures option payoffs, and the horizontal axis measures the possible stock prices on the option expiration date. Once again, these examples assume that the put has a strike price of $50, and that the option will be exercised only on its expiration date.

Figure 14.3 about here

In Figure 14.3, the put option payoffs are zero for all stock prices above the $50 strike price. This is so because a put option holder will not exercise the option to sell stock at the $50 strike price when the stock can be sold in the stock market at a higher price. In this case, the option expires worthless.

In contrast, if the stock price is lower than the $50 strike price, the put option payoff is equal to the difference between the market price of the stock and the strike price of the option. For example, if the stock price is $40, the put option payoff is equal to $10, which is the difference between the $40 stock price and the $50 strike price. This payoff is a cash inflow to the buyer, because the option buyer can buy the stock at the $40 market price and sell the stock at the $50 strike price. However, this payoff is a cash outflow to the writer, because the option writer must buy the stock at the $50 strike price when the stock's market price is $40.

Our payoff diagrams illustrate an important difference between the maximum possible gains and losses on puts and calls. Notice that if you buy a call option, there is no upper limit to your potential profit because there is no upper limit to the stock price. However, with a put option, the most you can make is the strike price. In other words, the best thing that can happen to you if you buy a put is for the stock price to go to zero. Of course, whether you buy a put or a call, your potential loss is limited to the option premium you pay.

Similarly, as shown in Figure 14.2, if you write a call, there is no limit to your possible loss, but your potential gain is limited to the option premium you receive. As shown in Figure 14.3, if you write a put, both your gain and loss are limited, although the potential loss could be substantial.

Options Profits

Between them, Figures 14.2 and 14.3 tells us essentially everything we need to know about the payoffs from the four basic strategies involving options, buying and writing puts and calls. However, these figures give the payoffs at expiration only and so do not consider the original cash

inflow or outflow. Option profit diagrams are an extension of payoff diagrams that do take into account the initial cash flow.

As we have seen, the profit from an option strategy is the difference between the option's terminal cash flow (the option payoff) and the option's initial cash flow (the option price, or premium). An option profit diagram simply adjusts option payoffs for the original price of the option. This means that the option premium is subtracted from the payoffs from buying an option and added to payoffs from writing options.

To illustrate, Figures 14.4 and 14.5 are two profit diagrams corresponding to the four basic investment strategies for options. In each diagram, the vertical axis measures option profits, and the horizontal axis measures possible stock prices. Each profit diagram assumes that the option's strike price is $50 and that the put and call option prices are both $10. Notice that in each case the characteristic hockey-stick shape is maintained; the “stick” is just shifted up or down.

Figures 14.4 and 14.5 about here

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14.3a What is option writing?

14.3b What are the payoffs from writing call options?

14.3c What are the payoffs from writing put options?

14.4 Option Strategies

Thus far, we have considered the payoffs and profits from buying and writing individual calls and puts. In this section, we consider what happens when we start to combine puts, calls, and shares of stock. There are numerous combinations that we could examine, but we will stick to just a few of the most basic and most important strategies.

The Protective Put Strategy

Suppose you own a share of TelMex (Telephonos de Mexico) stock, currently worth $50. Suppose you additionally purchase a put option with a strike price of $50 for $2. What is the net effect of this purchase?

To answer, we can compare what happens if TelMex stock stays at or above $50 to what happens if it drops below $50. If TelMex stays at or above $50, your put will expire worthless since you would choose not to exercise it. You would be out the $2. However, if TelMex falls below $50, you would exercise your put, and the put writer would pay you $50 for your stock. No matter how far below $50 the price falls, you have guaranteed that you will receive $50 for your stock.

Thus by purchasing a put option you have protected yourself against a price decline. In the jargon of Wall Street, you have paid $2 to eliminate the “downside” risk. For this reason, a strategy of buying a put option on a stock you own is called a **protective put** strategy.

(*marg. def.* **protective put** Strategy of buying a put option on a stock already owned. This protects against a decline in value.)

Notice that this use of a put option *reduces* the overall risk faced by an investor, so it is a conservative strategy. This is a good example of how options, or any derivative asset, can be used

to decrease risk rather than increase it. Stated differently, options can be used to hedge as well as speculate, so they do not inherently increase risk.

Buying a put option on an asset you own is just like buying term insurance. When you buy car insurance, for example, you are effectively buying a put option on your car. If, because of an accident or theft, your car's value declines, you "exercise" your option, and the insurance company essentially pays for the decline in value.

The Covered Call Strategy

Another conservative option strategy is to write call options on stock you already own. For example, again suppose you own some TelMex stock currently selling at $50. Now, instead of buying a put, consider selling a call option for, say, $2, with an exercise price of $55. What is the effect of this transaction?

To answer, we can compare what happens if TelMex stays below $55 (the exercise price on the option you sold) to what happens if it rises above $55. If TelMex stays below $55, the option will expire worthless, and you pocket the $2 premium you received. If the stock rises above $55, the option will be exercised against you, and you will deliver the stock in exchange for $55.

(*marg. def.* **covered call** Strategy of selling a call option on stock already owned.)

Thus when you sell a call option on stock you already own, you keep the option premium no matter what. The worst thing that can happen to you is that you will have to sell your stock at the exercise price. Since you already own the stock, you are said to be "covered," and this strategy is known as a **covered call** strategy.

With our covered call strategy, the stock is currently selling for $50. Since the strike price on the option is $55, the net effect of the strategy is to give up the possibility of a profit greater than $5 on the stock in exchange for the certain option premium of $2. This decreases the uncertainty surrounding the return on the investment and therefore decreases its risk.

In the jargon of Wall Street, a covered call exchanges "upside" potential for current income. In contrast, a strategy of selling call options on stock you do not own is a "naked" call strategy and, as we saw earlier, has unlimited potential losses. Thus selling call options is either quite risky or else acts to reduce risk, depending on whether you are covered or naked. This is important to understand.

Straddles

Suppose a share of stock is currently selling at $50. You think the price is going to make a major move, but you are uncertain about the direction. What could you do? One answer is buy a call *and* buy a put, both with a $50 exercise price. That way, if the stock goes up sharply, your call will pay off; if it goes down sharply, your put will pay off. This is an example of a long **straddle**.

> (*marg. def.* **straddle** Buying or selling a call and a put with the same exercise price. Buying is a *long straddle*; selling is a *short straddle*.)

This is called a "straddle" because you have, in effect, straddled the current $50 stock price. It is a long straddle because you bought both options. If you thought the stock price was *not* going to move in either direction, you might sell a put and a call, thereby generating some income. As long as the stock price stays at $50, both options would expire worthless. This is an example of a short straddle.

There are many other strategies, with colorful names such as strips, strangles, collars, and spreads, but we need to move on. In our next section, we discuss some upper and lower bounds on option values.

Example 14.4 Option Strategies You own a share of stock worth $80. Suppose you sell a call option with a strike price of $80 and also buy a put with a strike of $80. What is the net effect of these transactions on the risk of owning the stock?

Notice that what you have done is combine a protective put and a covered call strategy. To see the effect of doing this, suppose that at option expiration, the stock is selling for more than $80. In this case, the put is worthless. The call will be exercised against you, and you will receive $80 for your stock. If the stock is selling for less than $80, then the call is worthless. You would exercise your put and sell the stock for $80. In other words, the net effect is that you have guaranteed that you will exchange the stock for $80 no matter what happens, so you have created a riskless asset!

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14.4a What is a protective put strategy? A covered call strategy?

14.4b What is a short straddle? When might it be appropriate?

14.5 Option Prices, Intrinsic Values, and Arbitrage

There are strict limits to the range of values that an option price can attain in competitive options markets. We will have much to say about the determinants of an option's value in the next chapter. Here we touch on the subject by discussing some basic boundaries for the price of an option.

The Upper Bound for a Call Option Price

What is the most a call option could sell for? To answer, suppose we have a call option on a share of stock. The current stock price is $60. Without more information, we can't say a lot about the price of the call option, but we do know one thing: The price of the option must be less than $60!

If you think about it, the right to buy a share of stock cannot be worth more than the share itself. To illustrate, suppose the call option was actually selling for $65 when the stock was selling at $60. What would you do?

What you would do is get very rich, very fast. You would sell call options at $65 and buy stock at $60. You pocket the $5 difference. The worst thing that can happen to you is the options are exercised and you receive the exercise price. In this case, you make an unlimited amount of money at no risk.

This is an example of a true *arbitrage* opportunity. An arbitrage is an opportunity that (1) requires no net investment on your part, (2) has no possibility of loss, and (3) has at least the potential for a gain. The case of a call option selling for more than its underlying asset is a particularly juicy arbitrage because it puts money in your pocket today, and later either leaves you with stock you acquired at no cost or else leaves you with the exercise price on the option. Very nice, indeed! But too good to be true.

The Upper Bound for a Put Option

We've seen that a call option cannot sell for more than the underlying stock. How about a put option? To answer, suppose again that the stock price is $60. If a put sells for $65, is there an arbitrage opportunity?

It may look a little odd, but, without more information, we can't tell if there is an arbitrage or not. To see this, suppose the exercise price on the put option is $1,000. The right to sell a share of stock for $1,000 when its current worth is only $60 is obviously valuable, and it is obviously worth more than $65.

As this example suggests, the upper bound on put option's price depends on the strike price. To illustrate, suppose we have a put option with an exercise price of $50 and a price of $60. What would you do?

This situation is an arbitrage opportunity. You would simply sell puts at $60 and put the money in the bank. The worst thing that could happen to you is that you would have to buy the stock for $50 a share, leaving you with stock and $10 per share in cash (the difference between the $60 you received and the $50 you paid for the stock). So you would either end up with stock that cost you nothing to acquire plus some cash or, if the option expires worthless, you would keep the entire $60. We therefore conclude that a put option must sell for less than its strike price.

The Lower Bounds on Option Prices

Having established the most a call or put could sell for, we now want to know what is the least they could sell for. We observe that an option cannot have a negative value, since, by definition, an option can simply be discarded.

To further address this question, it is useful to define what is known as the **intrinsic value** of an option. The intrinsic value of an option is the payoff that an option holder receives if the underlying stock price does not change from its current value. Equivalently, it is what the option would be worth if it were expiring immediately.

> (*marg. def.* **intrinsic value** The payoff that an option holder receives assuming the underlying stock price remains unchanged from its current value.)

For example, suppose a certain call option contract specifies a strike price of $50, and the underlying stock price for the option is currently $45. Suppose the option was about to expire. With

the stock price at $45 and the strike at $50, this option would have no value. Thus this call option's intrinsic value is zero.

Alternatively, suppose the underlying stock price is currently $55. If the option was about to expire, it would be exercised, yielding a payoff of $5. This $5, which is simply the difference between the $55 stock price and the $50 strike price, is the call option's intrinsic value.

As another example of intrinsic value, suppose a put option has a strike price of $50, and the current stock price is $55. If the put were about to expire, it would be worthless. In this case, the put option's intrinsic value is zero.

Alternatively, suppose the underlying stock price was $45. The put option would be exercised yielding a payoff of $5, which is the difference between the $50 strike price and the $45 stock price. In this case, the put option's intrinsic value is $5.

Based on our examples, the intrinsic value of a call option and a put option can be written as follows, where S is a current stock price and K is the option's strike price. The term "*max*" is a shorthand notation for maximum.

$$\textbf{Call option intrinsic value} = max(0, S - K)$$

$$\textbf{Put option intrinsic value} = max(0, K - S)$$

This notation simply means that the intrinsic value of a call option is equal to $S - K$ or zero, whichever is bigger. Similarly, the intrinsic value of a put option is equal to $K - S$ or zero, whichever is bigger.

An option with a positive intrinsic value is said to be "in the money," and an option with a zero intrinsic value is said to be "out of the money" or "out the money." If the stock price and the strike price are essentially equal, the option is said to be "at the money." Thus a call option is in the

money when the stock price is greater than the strike price, and a put option is in the money when the stock price is less than the strike price.

Having defined an option's intrinsic value, we now ask: Is it possible for an option to sell for less than its intrinsic value? The answer is no. To see this, suppose a current stock price is S = \$60, and a call option with a strike price of K = \$50 has a price of C = \$5. Clearly, this call option is in the money, and the \$5 call price is less than the option's intrinsic value of S - K = \$10.

If you are actually presented with these stock and option prices, you have an arbitrage opportunity to obtain a riskless arbitrage profit by following a simple three-step strategy. First, buy the call option at its price of C = \$5. Second, immediately exercise the call option and buy the stock from the call writer at the strike price of K = \$50. At this point, you have acquired the stock for \$55, which is the sum of the call price plus the strike price.

As a third and final step, simply sell the stock at the current market price of S = \$60. Since you acquired the stock for \$55 and sold the stock for \$60, you have earned an arbitrage profit of \$5. Clearly, if such an opportunity continued to exist, you would repeat these three steps over and over until you became bored with making easy money (as if that could ever happen!). But realistically, such easy arbitrage opportunities do not exist, and it therefore follows that a call option price is never less than its intrinsic value.

A similar arbitrage argument applies to put options. For example, suppose a current stock price is S = \$40, and a put option with a strike price of K = \$50 has a price of P = \$5. This \$5 put price is less than the option's intrinsic value of K - S = \$10. To exploit this opportunity, you first buy the put option at its price of P = \$5, and then buy the stock at its current price of S = \$40. At this point, you have acquired the stock for \$45, which is the sum of the put price plus the stock price.

Now you immediately exercise the put option, thereby selling the stock to the option writer at the strike price of S = \$50. Since you acquired the stock for \$45 and sold the stock for \$50, you have earned an arbitrage profit of \$5. Again, you would not realistically expect such an easy arbitrage opportunity to actually exist, and therefore we conclude that a put option's price is never less than its intrinsic value.

Our conclusion that call option and put option prices are never less than their intrinsic values can be stated as follows, where the mathematical symbol "≥" means "greater than or equal to":

$$\textbf{Call option price} \geq \mathit{max}(0, S - K)$$

$$\textbf{Put option price} \geq \mathit{max}(0, K - S)$$

In plain English, these equations simply state that an option's price is never less than the intrinsic value of the option.

There is an important caveat concerning our lower bounds on option values. If you pick up the *Wall Street Journal*, it is relatively easy to find cases in which it appears an option is selling for less than its intrinsic value, at least by a small amount. However, if you tried to actually exploit the apparent arbitrage you would find that the prices in the *Journal* are not the ones you could actually trade at! There are a variety of reasons for this, but, at a minimum, keep in mind that the prices you see for the stock and the option are probably not synchronous, so the two prices may never have existed at the same point in time.

CHECK THIS

14.5a What is the most a call option could be worth? The least?

14.5b What is the most a put option could be worth? The least?

14.5c What is an out-of-the-money put option?

14.6 Stock Index Options

Following the tremendous success of stock options trading on the Chicago Board Options Exchange, the exchange looked for other new financial products to offer to investors and portfolio managers. In 1982, the CBOE created stock index options, which, at the time, represented a new type of option contract.

> (*marg. def.* **stock index option** An option on a stock market index. The most popular stock index options are options on the S&P 100 index, S&P 500 index, and Dow Jones Industrials index.)

Index Options: Features and Settlement

A **stock index option** is an option on a stock market index. The first stock index options were contracts on the Standard and Poor's index of 100 large companies representative of American industry. This index is often simply called the "S&P 100." S&P 100 index options trade under the ticker symbol OEX, and S&P 100 index options are referred to as "OEX options." The second stock index options introduced by the CBOE were contracts on the Standard and Poor's index of 500 companies, the "S&P 500." S&P 500 index options trade under the ticker symbol SPX and are referred to as "SPX options." In 1997, the CBOE introduced options on the Dow Jones Industrial Average (DJIA), which trade under the ticker symbol DJX.

Besides the different underlying indexes, the major difference between SPX, DJX, and OEX contracts are that OEX options are American style, whereas SPX and DJX options are European style. As we noted earlier, American-style options can be exercised any time before expiration, whereas European style options can be exercised only on the last day before option expiration.

Before stock index options could be introduced, one very important detail that had to be worked out was what to do when an option is exercised. It was obvious to exchange officials that actual delivery of all stocks comprising a stock index was impractical. Instead, a cash settlement procedure was adopted for stock index options. With cash settlement, when a stock index option is exercised, the option writer pays a cash amount to the option buyer based on the difference between the exercise date index level and the option's strike price. For example, suppose you had purchased an SPX call option with a strike price of $920, and the S&P 500 index was $940 on the day before option expiration. The difference between the index level and the strike price is $940 - $920 = $20. Since the contract size for SPX options is 100 times the S&P 500 index, the option writer must pay 100 × $20 = $2,000, which you receive as the option holder.

In the example above, the contract size for SPX options was stated to be 100 times the S&P 500 index. In fact, the contract size for almost all standardized stock index options is 100 times the underlying index. Thus the actual price of a stock index option is 100 times the price stated on an index level basis. There are only a few exceptions to this rule. For example, the CBOE offers so-called Reduced Value index options with a contract size that is one-tenth the size of standard index options. Reduced Value index options are appealing to some individual investors, but they represent only a minuscule share of all index options trading.

Index Option Price Quotes

There now exist a wide variety of stock market indexes for which options are available. Each business day, the *Wall Street Journal* provides a summary of the previous day's activity in stock index options. Figure 14.6, "Index Options Trading" excerpts this column.

Figure 14.6 about here

The most prominent component of this column is the box entitled "Ranges for Underlying Indexes," which contains information on the more than 35 major stock market indexes for which index options are now available. In the first column of this box, the name of each index and (in parentheses) its ticker symbol are listed. Columns 2, 3, 4, and 5 report the corresponding high, low, close, and net change values, respectively, for each stock market index from the previous days trading. For each stock index, the columns labeled "From Dec. 31" and "% Chg." report the dollar value change and percentage value change, respectively, since the beginning of the current year.

Outside the RANGES box, index options trading data are reported separately for each options exchange and index. Figure 14.6 contains information for options on several indexes. The first set of index options data is for the Chicago Board Mexico Index (MEX). MEX index option contracts were first introduced in 1994.

The first column of MEX data reports contract expiration months, and the second column reports strike prices. The letters next to each strike price denote whether the option is a call or a put. The third column reports trading volume measured as the number of contracts traded during the previous day's trading. The fourth column, labeled "Last," reports the contract price for the last trade of the previous day, and the fifth column, labeled "Net Change," reports the price change from the

last price on the previous day. Finally, the sixth column, labeled “Open Int.,” lists the total number of contracts outstanding.

At the bottom of the MEX listing, total call volume and open interest are reported, followed by put volume and open interest. Trading volume is measured by the number of contracts traded on a given day. Open interest is measured by the total number of contracts outstanding on a given day.

The vast majority of all trading in stock index options is conducted on the Chicago Board Options Exchange. In fact, most index options activity is concentrated in the S&P 100 and S&P 500 contracts traded on the CBOE. OEX trading volume is often almost twice as large as SPX trading volume, but SPX open interest is usually twice as large as OEX open interest. Figure 14.6 provides OEX and SPX information. Notice the large number of strike prices available for these contracts.

Example 14.5 Index options Suppose you bought 10 July 990 SPX call contracts at a quoted price of $5. How much did you pay in total? At option expiration, suppose the S&P 500 is at 1000. What would you receive?

The price per SPX contract is 100 times the quoted price. Since you bought 10 contracts, you paid a total of $5 × 100 × 10 = $5,000. If, at expiration, the S&P 500 is at 1000, you would receive $100 × (1000 - 990) = $1,000 per contract, or $10,000 in all. This $10,000 would be paid to you in cash, since index options feature cash settlement.

CHECK THIS

14.6a In addition to the underlying asset, what is the major difference between an ordinary stock option and a stock index option?

14.6b In addition to the underlying index, what is the major difference between the OEX and SPX option contracts?

14.7 The Options Clearing Corporation

Suppose that you ordered a new car through a local dealer and paid a $2,000 deposit. Further suppose that two weeks later you receive a letter informing you that your dealer had entered bankruptcy. No doubt, you would be quite upset at the prospect of losing your $2,000 deposit.

Now consider a similar situation where you pay $2,000 for several call options through a broker. On the day before expiration you tell your broker to exercise the options, since they would produce, say, a $5,000 payoff. Then, a few days later, your broker tells you that the call writer entered bankruptcy proceedings and that your $2,000 call premium and $5,000 payoff were lost. No doubt, this would also be quite upsetting. However, if your options were traded through a registered options exchange, the integrity of your options investment would be guaranteed by the **Options Clearing Corporation (OCC)**.

> (*marg. def.* **Options Clearing Corporation (OCC)** Private agency that guarantees that the terms of an option contract will be fulfilled if the option is exercised; issues and clears all option contracts trading on U.S. exchanges.)

The Options Clearing Corporation is the clearing agency for all options exchanges in the United States. Both the exchanges and the clearing agency are subject to regulation by the Securities and Exchange Commission (SEC). Most options investors are unaware of the OCC because only member firms of an options exchange deal directly with it. However, in fact, all option contracts traded on U.S. options exchanges are originally issued, guaranteed, and cleared by the OCC. Brokerage firms merely act as intermediaries between investors and the OCC.

To better understand the function of the OCC, let us examine a hypothetical order to buy options. In this example, assume that you instruct your broker to buy, say, 10 August 100 put options

on IBM. For simplicity, let us also assume that your broker works for a member firm of the CBOE and, therefore can relay your order directly to the CBOE.

When the order arrives at the CBOE, it is directed to one of several dealers for IBM options. The CBOE dealer accepts the order by taking the position of a writer for the 10 put contracts. The order is then transferred to the OCC. Once the OCC verifies that there are matching orders from a buyer and a writer, for a small fee it takes over the dealer's position as the writer for your 10 August 100 puts.

By assuming the writer's obligation, the clearing corporation guarantees that the terms of your put contracts will be fulfilled if you later decide to exercise the options. From the CBOE dealer's perspective, the clearing corporation becomes the buyer of the 10 August 100 puts. As such, the CBOE dealer becomes obligated to the clearing corporation as the writer of 10 August 100 put options.

In this way, all dealer default risk is transferred to the clearing corporation. Ultimately, the OCC ensures the performance of all options traded on all registered options exchanges in the United States. Without the OCC, these options exchanges could not function nearly as efficiently as they do in practice.

14.8 Summary and Conclusions

In 1973, organized stock options trading began when the Chicago Board Options Exchange (CBOE) was established. Since then, options trading has grown enormously. In this chapter, we examined a number of concepts and issues surrounding stock options. We saw that:

1. Options on common stock are derivative securities because the value of a stock option is derived from the value of the underlying common stock. There are two basic types of options: call options and put options. Call options are options to buy, and put options are options to sell.

2. Options are contracts. Standardized stock options represent a contract size of 100 shares of common stock per option contract. We saw how standardized option prices are quoted in the financial press.

3. Various strategies exist with options, ranging from buying and selling individual puts and calls to combination strategies involving calls, puts, and the underlying stock. There are many common strategies, including protective puts and covered calls.

4. Option prices have boundaries enforced by arbitrage. We saw that a call option cannot sell for more than the underlying asset, and a put option cannot sell for more than the strike price on the option.

5. An option's intrinsic value is a lower bound for an option's price. The intrinsic value of an option is the payoff that an option holder receives if the underlying stock price does not change from its current value.

6. A stock index option is an option on a stock market index such as the S&P 500. All stock index options use a cash settlement procedure when they are exercised. With a cash settlement procedure, when a stock index option is exercised, the option writer pays a cash amount to the option buyer.

7. The Options Clearing Corporation (OCC) is the clearing agency for all options exchanges in the United States. It guarantees that the terms of an option contracts are fulfilled if the option is exercised.

Key Terms

derivative security
call option
put option
strike price
intrinsic value
American options
European options
Options Clearing Corporation (OCC)
protective put
covered call
straddle
option writing
call writer
put writer
stock index option

Get Real!

This chapter added to your understanding of put and call options. In addition to covering the rights, obligations, and potential gains and losses involved, the chapter covered some basic option/stock strategies and stock index options. How should you put this information to work?

Now that you understand the most important features of stock and stock index options, you need to buy and sell a variety of them to experience the relatively large percentage real-world gains and losses that options can provide. So, with a simulated brokerage account (such as *Stock-Trak*), you should first execute each of the basic option transactions (buy a call, sell a call, buy a put, sell a put) for a variety of underlying stocks. To experience a wide range of possible outcomes, it is best to do each of these with out-the-money, at-the-money, and in-the-money options, so a total of a dozen transactions will be needed at a minimum. Pay careful attention to your commissions; they can be quite large as a percentage, particularly for small option purchases.

Once your option positions are established, follow the stock and option prices for a period of several weeks and then close. Calculate the percentage gains and losses on both the stock and the options.

The second types of trade to become familiar with are the covered call and protective put strategies, so execute these. You might also try a protective call on a short position (this trade is discussed in the end-of-chapter problems). A long and short straddle will round out your understanding of basic option trades.

A very common use of stock index put options is to insure an entire portfolio against adverse market movements. Execute such a transaction for your portfolio and evaluate its effectiveness. How large a purchase should you make? The answer is that it depends on how much insurance you want, but it is important not to create too large a position because then you essentially speculating on a market drop instead of just protecting against one.

STOCK-TRAK FAST TRACK

***TRADING STOCK OPTIONS WITH STOCK-TRAK*:**

Once you know how to trade common stocks and understand the basics of stock options, you should try your hand at trading stock options. You can buy, sell, and write stock options with your Stock-Trak account. There are some limitations, however, since options are not available for all stocks, and Stock-Trak restricts stock options trading to short-term options with maturities of less than one year. But these restrictions are quite minor.

There are four basic types of stock option trades:

1. Buy an option to open or increase a long position
2. Sell an option to close or reduce a long position
3. Write an option to open or increase a short position
4. Buy an option to cover or reduce a short position

We will here discuss by example the first two types of option trades: "buying" an option to take a long position, and "selling" an option to close all or part of a long position. Until you have acquired extensive experience with these trade types, you should avoid options writing.

To trade a particular stock option, you must first know the stock ticker symbol for the underlying stock. Then you must also know the ticker extension representing the strike price and maturity month of the specific contract you wish to trade. The process of obtaining this information is described next.

Suppose you want to buy five call option contracts for Coca-Cola (KO) and four put option contracts for Disney (DIS). Further, suppose that both options have a $50 strike price and a March expiration month. Your orders might be abbreviated to look like this:

Buy 5 KO-CJ

Buy 4 DIS-OJ

Notice that in addition to the stock ticker symbols, these option tickers have a two-letter extension denoting the option type - call or put - and the strike price and expiration month. The first letter represents the option type and expiration month. The second letter represents the strike price.

Converting option type, expiration month, and strike price to the correct two-letter ticker extension is easily done using Table ST.1. When the strike price is greater than 100, simply subtract 100 and use the result to specify a strike code, for example, a strike of 135 has the strike code G, the same as for a strike of 35.

Table ST.1 Stock Option Ticker Symbol Codes						
Expiration Month	**Calls**	**Puts**	**Strike**		**Strike**	
January	A	M	5	A	70	N
February	B	N	10	B	75	O
March	C	O	15	C	80	P
April	D	P	20	D	85	Q
May	E	Q	25	E	90	R
June	F	R	30	F	95	S
July	G	S	35	G	100	T
August	H	T	40	H	7.5	U
September	I	U	45	I	12.5	V
October	J	V	50	J	17.5	W
November	K	W	55	K	22.5	X
December	L	X	60	L	27.5	Y
			65	M	32.5	Z

Notice in Table ST.1 that the 12 letters A-L denote the 12 expiration months January through December for call options. Similarly, the 12 letters M-X denote the 12 expiration months for put options. The 20 letters A-T represent the strike prices 5 through 100 in five-dollar increments. The 6 letters U-Z are reserved for the 6 strikes 7.5, 12.5, 17.5, 22.5, 27.5, and 32.5, respectively.

Options exchanges use special option tickers for NASDAQ stocks, which have four or more letters in their ticker symbols. Stock-Trak insulates its customers from this inconvenience and accepts the full NASDAQ stock ticker for option orders. This is also standard practice among brokerage firms accepting customer orders..Table ST.2 provides several examples of Stock-Trak option tickers and their corresponding options exchange versions.

Table ST.2 Exchange and Stock-Trak Tickers for July 40 Call (GH) Options		
NASDAQ Company (Ticker)	Exchange ticker	Stock-Trak ticker
Microsoft (MSFT)	MSQ-GH	MSFT-GH
Novell (NOVL)	NKQ-GH	NOVL-GH
Sun Microsystems (SUNW)	SUQ-GH	SUNW-GH

If you are interested in seeing more options exchange tickers, a complete list can be found at the CBOE website (www.cboe.com).

STOCK-TRAK EXERCISES

1. What are the option types, expiration months, and strike prices for the following Micron Technology (MU) options: MU-FF, MU-RF, MU-HK, MU-TL?
2. What are the two-letter ticker extensions for the following options: January 80 calls, July 25 puts, April 12.5 calls, October 27.5 puts?

***TRADING DOW JONES INDEX OPTIONS WITH STOCK-TRAK*:**

In addition to trading stock options with your Stock-Trak account, you can also trade options on many stock market indexes. To trade stock index options, you must first decide which particular stock index you want to use for options trading and find the ticker symbol for that index. You must also know the ticker extension for the strike price and maturity month. Also be aware that the ticker extensions for stock index options may not be the same as for stock options.

The best known stock index in the world is the Dow Jones Industrial Average (DJIA). The standard ticker symbol for this index is DJX, and DJX options trade on the Chicago Board Options

Exchange (CBOE). Strike prices for DJX options are stated in unit increments representing 1/100 of the underlying index level. For example, strike prices of 100, 101, and so on correspond to index levels of 10,000, 10,100, and so on, which are 100 times the stated strike price. However, the contract value for a single DJX option contract corresponds to the full value of the index, which we hope will be over 10,000 when you read this.

For example, suppose you bought three September 101 DJX call options. If at expiration the DJIA was at, say, 10,250, your payoff would be 3 contracts × (10,250 - 10,100) = $450. As another example, suppose you bought four July 119 DJX put options and at expiration the DJIA was 11,825. Then your payoff would be 4 contracts × (11,900 - 11,825) = $300.

DJX option tickers also have two-letter extensions denoting the option type (call or put), strike price, and expiration month. Just like stock options, the first letter represents the option type and expiration month, and the second letter represents the strike price. The letter codes for the option type and expiration month are the same as for stock options. However, DJX options have special strike price codes. These DJX strike codes are listed in Table ST.3.

For example, orders to buy three DJX September 133 calls and four DJX July 131 puts might be abbreviated as

Buy 3 DJX-IC contracts

Buy 4 DJX-SA contracts

Notice that just like stock options, September calls and July puts are denoted by the letters I and S, respectively. However, letter codes for the 133 and 131 strike prices are C and A, respectively, as indicated in the table.

In addition to options on the DJIA, you can also trade options on the Dow Jones Transportation Average (DJTA) and the Dow Jones Utilities Average (DJUA). The ticker symbols for these indexes are DJT and DJU, respectively, and their strike price codes are identical to those used for DJX options.

For more information on these options, consult the CBOE website (www.cboe.com).

STOCK-TRAK EXERCISES

1. What are the two-letter ticker extensions for the following Dow Jones index options: January 106 calls, July 111 puts, April 136 calls, October 116 puts?
2. Given an index level of 11,000, what are the option types, expiration months, and strike prices for the following options on the Dow Jones Industrial Average: DJX-EO, DJX-QY, DJX-JL, DJX-HW? (Hint: When a strike code might refer to several strikes, assume the strike nearest the current index level.)

Table ST.3 Dow Jones Averages Strike Price Codes					
Code	**Strike price**				
A	27	53	79	105	131
B	28	54	80	106	132
C	29	55	81	107	133
D	30	56	82	108	134
E	31	57	83	109	135
F	32	58	84	110	136
G	33	59	85	111	137
H	34	60	86	112	138
I	35	61	87	113	139
J	36	62	88	114	140
K	37	63	89	115	141
L	38	64	90	116	142
M	39	65	91	117	143
N	40	66	92	118	144
O	41	67	93	119	145
P	42	68	94	120	146
Q	43	69	95	121	147
R	44	70	96	122	148
S	45	71	97	123	149
T	46	72	98	124	150
U	47	73	99	125	151
V	48	74	100	126	152
W	49	75	101	127	153
X	50	76	102	128	154
Y	51	77	103	129	155
Z	52	78	104	130	156

TRADING STANDARD AND POOR'S INDEX OPTIONS WITH STOCK-TRAK

The two most popular stock indexes for options trading are Standard and Poor's indexes; specifically the S&P 100 and S&P 500 indexes. Standard ticker symbols for these indexes are OEX for the S&P 100 and SPX for the S&P 500. OEX and SPX option tickers use the same two-letter extensions as stock options to specify the option type (call or put) strike price, and expiration month. Thus like stock options, the first letter represents the option type and expiration month, and the second letter represents the strike price.

At the time this was written, SPX and OEX levels were around 1,300 and 650, respectively, options for both indexes had available strike prices spanning more than 100 points. This created a problem when specifying option tickers that distinguished between, say, the 1,360 and 1,460 strikes. To handle this problem, the SPX ticker was split between the designations SPX and SPB. The SPX ticker was used for strikes in the 1300s and the SPB ticker was used for strikes in the 1400s. Likewise, the OEX ticker was split between OEX and OEW designations. OEX was used for strikes in the 600s, and OEW was used for strikes in the 700s.

For example, SPX-SJ referred to July 1350 puts and SPB-GJ referred to July 1450 calls. Likewise, OEX-PL referred to April 660 puts and OEW-DL referred to April 760 calls. The designations in effect when you want to trade SPX and OEX options will depend on the current SPX and OEX index levels. You should consult the CBOE website (www.cboe.com) for the necessary information.

STOCK-TRAK EXERCISES

1. What are the two-letter ticker extensions for the following SPX index options: January 1390 calls, July 1375 puts, April 1410 calls, October 1420 puts?
2. Given an index level of 1350, what are the option types, expiration months, and strike prices for the following options on the S&P 500 index: SPX-EO, SPB-QF, SPX-JL, SPB-VB?
2. Through the website for this text book (www.mhhe.com/cj), go to the Stock-Trak website and review the latest information about trading options with Stock-Trak.

Chapter 14
Stock Options

Questions and problems

Review Problems and Self-Test

1. **Call option payoffs** Suppose you purchase 15 call contracts on Scholes Co. stock. The strike price is $220, and the premium is $10. If the stock is selling for $240 per share at expiration, what are your call options worth? What is your net profit? What if the stock were selling for $230? $220?

2. **Stock versus options** Stock in Black Manufacturing is currently priced at $90 per share. A call option with a $90 strike and 60 days to maturity is quoted at $5. Compare the percentage gains and losses from a $9,000 investment in the stock versus the option in 60 days for stock prices of $60, $90, and $120.

Answers to Self-Test Problems

1. The stock is selling for $240. You own 15 contracts, each of which gives you the right to buy 100 shares at $220. You options are thus worth $20 per share on 1500 shares, or $30,000. The option premium was $10, so you paid $1,000 per contract, or $15,000 total. Your net profit is $15,000. If the stock is selling for $230, your options are worth $15,000, so your net profit is exactly zero. If the stock is selling for $220, your options are worthless and you lose the entire $15,000 you paid.

2. The stock costs $90 per share, so if you invest $9,000, you'll get 100 shares. The option premium is $5, so an option contract costs $500. If you invest $9,000, you'll get $9,000/$500 = 18 contracts. If the stock is selling for $120 in 90 days, your profit on the stock is $30 per share, or $3,000 total. The percentage gain is $3,000/$9,000 = 33.33%.

Similarly, in this case, your options are worth $30 per share, or $3,000 per contract. However, you have 18 contracts, so your options are worth $54,000 in all. Since you paid $9,000 for the 18 contracts, your profit is $45,000. Your percentage gain is a whopping $45,000/$9,000 = 500%.

If the stock is selling for $90, your profit is $0 on the stock, so your percentage return is 0 percent. Your options are worthless (why?); the percentage loss is -100 percent. If the stock is selling for $60, verify that your percentage loss on the stock is -33.33 percent and your loss on the option is again -100 percent.

Test Your IQ (Investment Quotient)

1. **Option Contracts** Which of the following is not specified by a stock option contract?

a. price of the underlying stock
b. contract size
c. exercise style
d. contract settlement procedure

2. **Option Contracts** A July 50 call option contract for YXZ stock is identified by which ticker symbol? (Hint: See the Stock-Trak section at the end of this chapter.)

a. YXZ-JG
b. YXZ-JS
c. YXZ-GJ
d. YXZ-SJ

3. **Option Contracts** An April 40 put option contract for YXZ stock is identified by which ticker symbol? (Hint: See the Stock-Trak section at the end of this chapter.)

a. YXZ-HD
b. YXZ-HP
c. YXZ-DH
d. YXZ-PH

4. **Option Strategies** Which of the following stock option strategies has the potential for the largest loss?

a. writing a covered call
b. writing a covered put
c. writing a naked call
d. writing a naked put

5. **Option Strategies** Which statement describes an at-the-money protective put position (comprised of owning the stock and the put? (*1992 CFA Exam*)

a. protects against loss at any stock price below the strike price of the put
b. has limited profit potential when the stock price rises
c. returns any increase in the stock's value, dollar for dollar, less the cost of the put
d. provides a pattern of returns similar to a stop-loss order at the current stock price

6. Option Strategies Which of the following yields a defensive/protective strategy?

a. writing a naked put
b. buying a put on stock you currently own
c. writing a call against stock you currently hold short
d. buying a call on a stock you own

7. Option Strategies Investor A uses options for defensive and income reasons. Investor B uses options as an aggressive investment strategy. What is an appropriate use of options for Investors A and B respectively? (*1990 CFA Exam*)

a. writing covered calls / buying puts on stock not owned
b. buying out-of-the-money calls / buying puts on stock owned
c. writing naked calls / buying in-the-money calls
d. selling puts on stock owned / buying puts on stock not owned

8. Option Strategies How is a long straddle position constructed?

a. write a call and write a put
b. buy a call and buy a put
c. write a call and buy a put
d. buy a call and write a put

9. Option Strategies Which one of the following option combinations best describes a straddle? Buy both a call and a put on the same stock with (*1994 CFA Exam*)

a. different exercise prices and the same expiration date
b. the same exercise price and different expiration dates
c. the same exercise price and the same expiration date
d. different exercise prices and different expiration dates

10. Option Strategies Which is the riskiest options transaction if the underlying stock price is expected to increase substantially?

a. writing a naked call
b. writing a naked put
c. buying a call
d. buying a put

11. Option Gains and Losses You create a "strap" by buying two calls and one put on ABC stock, all with a strike price of $45. The calls cost $5 each, and the put costs $4. If you close your position when ABC stock is priced at $55, what is your per share gain or loss? (*1993 CFA Exam*)

a. $4 loss
b. $6 gain
c. $10 gain
d. $20 gain

12. Option Gains and Losses A put on XYZ stock with a strike price of $40 is priced at $2.00 per share, while a call with a strike price of $40 is priced at $3.50. What is the maximum per-share loss to the writer of the uncovered put and the maximum per-share gain to the writer of the uncovered call? (*1993 CFA Exam*)

	Maximum Loss to Put Writer	Maximum Gain to Call Writer
a.	$38.00	$3.50
b.	$38.00	$36.50
c.	$40.00	$3.50
d.	$40.00	$40.00

13. Option Pricing If a stock is selling for $25, the exercise price of a put option on that stock is $20, and the time to expiration of the option is 90 days, what are the minimum and maximum prices for the put today? (*1991 CFA Exam*)

c. $0 and $5
b. $0 and $20
c. $5 and $20
d. $5 and $25

14. Option Strategies Which of the following strategies is most suitable for an investor wishing to eliminate "downside" risk from a stock?

a. long straddle
b. short straddle
c. covered call
d. protective put

15. Index Options What is the ticker symbol for the S&P 100 index?

a. SPC
b. SPM
c. SPX
d. OEX

16. Index Options What is the ticker symbol for the S&P 500 index?

a. SPC
b. SPM
c. SPX
d. OEX

Questions and Problems

Core Questions

1. Basic Properties of Options What is a call option? A put option? Under what circumstances might you want to buy each? Which one has greater potential profit? Why?

2. Calls versus Puts Complete the following sentence for each of these investors:

a. A buyer of call options
b. A buyer of put options
c. A seller (writer) of call options
d. A seller (writer) of put options

The (buyer/seller) of a (put/call) option (pays/receives) money for the (right/obligation) to (buy/sell) a specified asset at a fixed price for a fixed length of time.

3. Call Option Payoffs Suppose you purchase five call contracts on Macron Technology stock. The strike price is $50, and the premium is $2. If, at expiration, the stock is selling for $60 per share, what are your call options worth? What is your net profit?

4. Put Option Payoffs Suppose you purchase eight put contracts on Testaburger Co. The strike price is $30, and the premium is $3. If, at expiration, the stock is selling for $20 per share, what are your put options worth? What is your net profit?

5. **Stock versus Options** Stock in Cheezy-Poofs Manufacturing is currently priced at $100 per share. A call option with a $100 strike and 90 days to maturity is quoted at $5. Compare the percentage gains and losses from a $10,000 investment in the stock versus the option in 90 days for stock prices of $80, $100, and $120.

Use the following options quotations to answer questions 6 through 9:

Option&	Strike		Calls		Puts	
NY Close	Price	Expiration	Vol.	Last	Vol.	Last
Hendreeks						
86	80	Feb	72	7	50	3/4
86	80	Mar	41	8 1/8	29	1 9/16
86	80	May	16	9 7/8	10	2 7/8
86	80	Aug	8	12	2	4 1/4

6. **Calculating Option Payoffs** Suppose you buy 60 February 80 call option contracts. How much will you pay, ignoring commissions?

7. **Calculating Option Payoffs** In Problem 6, suppose that Hendreeks stock is selling for $95 per share on the expiration date. How much is your options investment worth? What if the terminal stock price is $86?

8. **Calculating Option Payoffs** Suppose you buy 25 August 80 put option contracts. What is your maximum gain? On the expiration date, Hendreeks is selling for $55 per share. How much is your options investment worth? What is your net gain?

9. **Calculating Option Payoffs** In Problem 8, suppose you write 25 of the August 80 put contracts. What is your net gain or loss if Hendreeks is selling for $55 at expiration? For $100? What is the break-even price, that is, the terminal stock price that results in a zero profit?

10. **Option Breakeven** In general, if you buy a call option, what stock price is needed for you to break even on the transaction ignoring taxes and commissions? If you buy a put option?

Intermediate Questions

11. **Protective Puts** Buying a put option on a stock is sometimes called “stock price insurance.” Why?

12. **Defining Intrinsic Value** What is the intrinsic value of a call option? How do we interpret this value?

13. **Defining Intrinsic Value** What is the intrinsic value of a put option? How do we interpret this value?

14. **Call Option Writing** Suppose you write 20 call option contracts with a $40 strike. The premium is $2. Evaluate your potential gains and losses at option expiration for stock prices of $30, $40, and $50.

15. **Put Option Writing** Suppose you write 10 put option contracts with a $20 strike. The premium is $1. Evaluate your potential gains and losses at option expiration for stock prices of $10, $20, and $30.

16. **Index Options** Suppose you buy one SPX option contract with a strike of 1300. At maturity, the S&P 500 index is at 1350. What is you net gain or loss if the premium you paid was $20?

17. **Arbitrage and Options** You notice that shares of stock in the Patel Corporation are going for $50 per share. Call options with an exercise price of $35 per share are selling for $10. What's wrong here? Describe how would you could take advantage of this mispricing if the option expires today.

Use the following options quotations to answer questions 18 through 21:

Option&	Strike		Calls		Puts	
NY Close	Price	Expiration	Vol.	Last	Vol.	Last
Milson						
59	55	Mar	98	3 1/2	66	1 1/16
59	55	Apr	54	6 1/4	40	1 15/16
59	55	Jul	25	8 5/8	17	3 5/8
59	55	Oct	10	10 1/4	5	3 1/4

18. **Interpreting Options Quotes** How many options contracts on Milson stock were traded with an expiration date of July? How many underlying shares of stock do these options contracts represent?

19. **Interpreting Options Quotes** Are the call options in the money? What is the intrinsic value of a Milson Corp. call option?

20. **Interpreting Options Quotes** Are the put options in the money? What is the intrinsic value of a Milson Corp. put option?

21. **Interpreting Options Quotes** Two of the options are clearly mispriced. Which ones? At a minimum, what should the mispriced options sell for? Explain how you could profit from the mispricing in each case.

22. Option Strategies Recall the options strategies of a protective put and covered call discussed in the text. Suppose you have sold short some shares of stock. Discuss analogous option strategies and how you would implement them (Hint: They're called protective calls and covered puts).

Chapter 14
Stock Options
Answers and solutions

Answers to Multiple Choice Questions

1. A
2. C
3. D
4. C
5. C
6. B
7. A
8. B
9. C
10. A
11. B
12. A
13. B
14. D
15. D
16. C

Core Questions

1. Assuming American-style exercise, a call option confers the right, without the obligation, to buy an asset at a given price on or before a given date. An American-style put option confers the right, without the obligation, to sell an asset at a given price on or before a given date. European-style options are the same except that exercise can only occur at maturity. One reason you would buy a call option is that you expect the price of the asset to increase. Similarly, you would buy a put option if you expect the price of the asset to decrease. In both cases, other reasons exist, but these are the basic ones. A call option has unlimited potential profit, while a put option has limited potential profit; the underlying asset's price cannot be less than zero.

2. a. The buyer of a call option pays money for the right to buy....
b. The buyer of a put option pays money for the right to sell....
c. The seller of a call option receives money for the obligation to sell....
d. The seller of a put option receives money for the obligation to buy....

3. Your options are worth $60 - $50 = $10 each, or $1,000 per contract. With five contracts, the total value is $5,000. Your net profit is $5,000 less the $1,000 (5 contracts at $200 each) you invested, or $4,000.

4. Your options are worth $30 - $20 = $10 each, or $1,000 per contract. With eight contracts, the total value is $8,000. Your net profit is $8,000 less the $2,400 (8 contracts at $300 each) you invested, or $5,600.

5. The stock costs $100 per share, so if you invest $10,000, you'll get 100 shares. The option premium is $5, so an option contract costs $500. If you invest $10,000, you'll get $10,000/500 = 20 contracts. If the stock is selling for $120 in 90 days, your profit on the stock is $20 per share, or $2,000 total. The percentage gain is $2,000/10,000 = 20%.

Similarly, in this case, your options are worth $20 per share, or $2,000 per contract. However, you have 20 contracts, so your options are worth $40,000 in all. Since you paid $10,000 for the 20 contracts, your profit is $30,000. Your percentage gain is a pleasant $30,000/$10,000 = 300%.

If the stock is selling for $100, your profit is $0 on the stock, so your percentage return is 0%. Your option is worthless (why?); the percentage loss is -100%. If the stock is selling for $80, verify that your percentage loss on the stock is -20% and your loss on the option is again -100%.

6. 60 contracts at $700 per contract = $42,000

7. Stock price = $95: option value = 60(100)($95 – $80) = $90,000
Stock price = $86: option value = 60(100)($86 – $80) = $36,000.

8. Initial cost= 25(100)($4.25) = $10,625; maximum gain= 25(100)($80)–$10,625 = $189,375.
Terminal value= 25(100)($80 – $55) = $62,500; net gain = $62,500 – $10,625 = $51,875

9. Stock price = $55: net loss = $10,625 – $62,500 = – $51,875.
Stock price = $100: net gain = $10,625.
The breakeven stock price is the $80 exercise price less the premium of $4.25, or $75.75. For terminal stock prices above $75.75, the premium received more than offsets any loss, so the writer of the put option makes a net profit (ignoring the effects of the time value of money).

10. In general, the breakeven stock price for a call purchase is the exercise price plus the premium paid. For stock prices higher than this, the purchaser realizes a profit. For a put purchase, it's the strike price less the premium. For stock prices lower than this, the purchaser realizes a profit.

Intermediate Questions

11. If you buy a put option on a stock that you already own, you guarantee that you can sell the stock for the strike price on the put. Thus, you have in effect insured yourself against stock price declines beyond this point. This is the protective put strategy.

12. The intrinsic value of a call option is max{S – K,0}. It is the value of the option at expiration.

13. The value of a put option at expiration is max{K – S,0). By definition, the intrinsic value of an option is its value at expiration, so max{K – S,0} is the intrinsic value of a put option.

14. You get to keep the premium in all cases. For 20 contracts and a $2 premium, that's $4,000. If the stock price is $30 or $40, the options expire worthless, so your net profit is $4,000. If the stock price is $50, you lose $10 per share on each of 2,000 shares, or $20,000 in all. You still have the premium, so your net loss is $16,000.

15. You get to keep the premium in all cases. For 10 contracts and a $1 premium, that's $1,000. If the stock price is $20 or $30, the options expire worthless, so your net profit is $1,000. If the stock price is $10, you lose $10 per share on each of 1,000 shares, or $10,000 in all. You still have the premium, so your net loss is $9,000.

16. The contract costs $2,000. At maturity, an in-the-money SPX option is worth 100 times the difference between the S&P index and the strike, or $5,000 in this case You net profit is $3,000.

17. The call is selling for less than its intrinsic value; an arbitrage opportunity exists. Buy the call for $10, exercise the call by paying $35 in return for a share of stock, and sell the stock for $50. You've made a riskless $5 profit.

18. 42 contracts were traded, 25 calls and 17 puts; this represents options on 4,200 shares of Milson stock.

19. The calls are in the money. The intrinsic value of the calls is $4.

20. The puts are out of the money. The intrinsic value of the puts is $0.

21. The March call and the October put are mispriced. The call is mispriced because it is selling for less than its intrinsic value. The arbitrage is to buy the call for $3.50, exercise it and pay $55 for a share of stock, and sell the stock for $59 for a riskless profit of $0.50. The October put is mispriced because it sells for less than the July put. To take advantage of this, sell the July put for $3.63 and buy the October put for $3.25, for a cash inflow of $0.38. The exposure of the short position is completely covered by the long position in the October put, with a positive cash inflow today.

22. The covered put would represent writing put options on the stock. This strategy is analogous to a covered call because the upside potential of the underlying position, (which in the case of a short sale would be a decline in the stock price), is capped in exchange for the receipt of the option premium for certain.

The protective call would represent the purchase of call options as a form of insurance for the short sale position. If the stock price rises, then losses incurred on the short sale are offset, or insured, by gains on the call options; however, if the stock price falls, which represents a profit to the short seller, then only the purchase price of the option is lost.

Figure 14.1 LISTED OPTIONS QUOTATIONS

Thursday, January 14, 1999

Composite volume and close for actively traded equity and LEAPS, or long-term options, with results for the corresponding put or call contract. Volume figures are unofficial. Open interest is total outstanding for all exchanges and reflects previous trading day. Close when possible is shown for the underlying stock on primary market. **CB**-Chicago Board Options Exchange. **AM**-American Stock Exchange. **PB**-Philadelphia Stock Exchange. **PC**-Pacific Stock Exchange. **NY**-New York Stock Exchange. **XC**-Composite. **p**-Put.

MOST ACTIVE CONTRACTS

Option/Strike				Vol	Exch	Last	Net Chg	a-Close	Open Int
DellCptr	Jan	80		15,323	AM	7⅛	– ⅞	77⅝	20,420
BostChkn	Jan	5	p	13,982	XC	4⅜	– 1/16		54,490
MicrTc	Jan	70		8,147	XC	11¼	– 11¼	69⅜	7,528
WasteMInc	Jan	25		8,107	XC	12¼	– ¼		9,179
EKodak	Jul	70	p	8,026	CB	5⅝	+ ¼	70 5/16	1,022
CienaCp	Jan	20		7,814	XC	⅜	...	18 11/16	23,754
Schering	Jan	25		7,684	PC	26	+ ¼	51 1/16	18,656
Intel	Jan	140		7,342	AM	¼	– 17⅛	133¾	11,378
Intel	Jan	135		7,303	AM	11¼	– 3¾	133¾	10,359
USA Wste	Jan	00	40	7,300	XC	16	+ 5¾	50 15/16	5,451
AT&T	Jan	00	80	p 5,581	CB	8⅝	+ ⅝	82 1/16	2,858
AmOnline	Jan		150	5,534	XC	15/16	– 11 1/16	144½	25,518
Compaq	Jan		45	5,380	XC	7/16	– 19/16	44 9/16	24,212
Iomega	May		7½ p	4,951	XC	1⅛	...	9	57,704
Intel	Jan	130	p	4,930	AM	½	+ ¼	133¾	7,640
MCI Wrld	Jun		45	4,930	XC	26¾	– 3¾	71	664
Amazon	Feb		100	4,910	XC	46⅝	– 4⅜	138	22,224
BankAm	Feb		65	p 4,739	XC	5½	+ 1⅞	62 7/16	12,466
TelBrasH	Jan		40	p 4,548	XC	1/16	– 1/16	54 1/16	14,856
AppleC	Feb		45	4,536	XC	29/16	– 2 13/16	41⅜	2,992

Option/Strike				Vol	Exch	Last	Net Chg	a-Close	Open Int
Citigroup	Mar	50	p	4,447	XC	4	+ ½	50½	7,664
TycoLb	Jan	75	p	4,412	PB	3⅛	– 1½	72 1/16	4,412
EKodak	Jul	75		4,358	CB	4¾	– 3⅞	70 5/16	153
Citigroup	Jan	50	p	4,177	XC	5/8	+ 1/8	50½	14,168
Intel	Jan	135	p	4,123	AM	27/16	+ 15/16	133¾	5,436
AT&T	Jan 00	70	p	4,105	CB	5	+ ¾	82 1/16	3,339
AscendC	Jan	80		3,997	XC	2⅛	+ ½	82⅛	26,240
M C I	Jan	25		3,997	XC	63	– 47⅞		8,438
Cisco	Jan	100		3,951	XC	½	– ¼	96⅜	19,924
LockhdM	Feb	40	p	3,888	XC	3⅜	+ 1⅛	38¾	2,382
Amazon	Apr	110		3,840	XC	46½	– 1½	138	27,100
LockhdM	Jan	40	p	3,710	XC	1⅜	+ ½	38¾	21,968
BankAm	Feb		65	3,680	XC	3⅛	– 1⅛	62 7/16	16,000
Micsft	Jan		150	3,659	PC	1⅛	– ⅜	141¾	12,163
AmOnline	Jan		155	3,657	XC	⅜	– ⅞	144½	19,041
DellCptr	Feb		80	3,594	AM	5⅛	– ⅝	77⅝	17,935
RJRNab	Mar	27½	p	3,560	XC	2	+ ⅜	27 13/16	2,661
TelBrasH	Apr		100	3,545	XC	9/16	– 3/16	54⅛	16,329
Motorola	Jan		70	3,506	AM	1/8	– 2¼	66¼	8,845
AmOnline	Jan		150	p 3,496	XC	6⅛	– ⅞	144½	24,048

Option/Strike	Exp.	Call Vol.	Call Last	Put Vol.	Put Last
AES Cp	35	Feb	35	4⅛	715	2 1/16
36⅞	40	Feb	550	11 5/16	128	4½
A M R	65	Jan	442	⅛	150	2¾
ASM Litho	45	Apr	...	...	560	8⅝
AT&T	60	Jan	691	22	...	...
82 1/16	70	Jan	1379	12½	...	...
82 1/16	75	Jan	1655	7	...	...
82 1/16	75	Feb	2519	9¼	448	1½
82 1/16	75	Apr	370	11	30	3⅛
82 1/16	80	Jan	1671	2¼	602	5/16
82 1/16	80	Feb	600	5⅞	202	3⅜
82 1/16	80	Apr	466	8	81	4⅞
82 1/16	85	Feb	1351	3¼	15	5½
82 1/16	90	Feb	610	1½	20	9¼
82 1/16	90	Apr	464	3½	...	...
AdvFibCm	10	Jan	435	3¾	...	...
13½	12½	Jan	1295	1 3/16	105	¼
13½	12½	Feb	884	2⅝	191	1 9/16
13½	15	Feb	2409	1⅝	16	2¾
A M D	20	Jan	568	2½	487	⅛
22⅜	20	Feb	280	4	2759	1¼
22⅜	20	Apr	191	5	649	2¼
22⅜	22½	Jan	800	⅝	1368	1
22⅜	22½	Feb	707	2⅞	614	2½
22⅜	22½	Apr	434	3½	145	3
22⅜	25	Jan	1641	⅛	1627	2¾
22⅜	25	Feb	2529	1¾	1119	4
22⅜	25	Apr	611	2⅞	1319	4¾

Option/Strike	Exp.	Call Vol.	Call Last	Put Vol.	Put Last
22⅜	27½	Jan	568	1 1/16	402	5⅛
22⅜	27½	Feb	402	1⅛	1325	5⅞
22⅜	30	Jan	326	1/16	1178	7¼
22⅜	30	Feb	1607	⅝	364	7¾
22⅜	30	Apr	829	1 9/16	95	7¾
22⅜	32½	Jan	91	1/16	561	10½
22⅜	35	Feb	386	⅜	15	12¾
Aetna	75	Jan	1410	1 1/16	...	...
84 13/16	75	Feb	1400	1 1/16	51	¾
AgriBio	17½	Feb	432	1	3	3⅝
14⅞	17½	Apr	1016	1½	95	5
14⅞	20	Apr	545	1	...	...
Airtch	70	Feb	2855	12⅛	600	17⅛
78 13/16	75	Feb	101	7½	448	3⅛
78 13/16	80	Jan	539	¾	125	17⅛
78 13/16	80	Feb	1415	4⅝	140	5½
AmaxGl	25	Jan	...	...	600	4⅛
...	25	Apr	...	...	600	5½
Amazon	83⅜	Jan	49	57¾	880	1/16
138	93⅜	Feb	...	...	1051	6¼
138	100	Feb	4910	46⅝	228	7½
138	110	Jan	147	32½	374	⅜
138	110	Feb	43	46	353	10
138	110	Apr	3840	46½	48	15⅝
138	113⅜	Jan	33	26¾	466	¼
138	120	Jan	52	25	1313	¾
138	130	Jan	161	12	1023	2
138	130	Feb	195	28½	357	16⅞

Option/Strike	Exp.	Call Vol.	Call Last	Put Vol.	Put Last
138	140	Jan	805	5⅞	1762	5
138	140	Feb	193	22	812	20¾
138	150	Jan	1681	1⅞	1832	11
138	150	Feb	1014	2 15/16	302	29⅛
138	160	Jan	1533	¾	431	22
138	160	Feb	613	1 4/16	104	34½
138	170	Jan	1427	⅝	143	30⅜
138	180	Jan	395	⅞	119	40
138	190	Jan	426	1/16	15	49⅛
138	200	Jan	852	1/16	189	60
AmOnline	12½	Jan	2663	136	...	...
144½	100	Jan	1870	46⅛	...	...
144½	120	Feb	44	30⅝	1444	6¼
144½	120	Apr	15	38⅝	512	12½
144½	125	Feb	63	27½	664	7
144½	130	Feb	97	24½	371	8⅞
144½	135	Jan	158	10¼	698	½
144½	140	Jan	1366	5½	2281	1⅛
144½	140	Feb	376	18½	282	12⅞
144½	145	Jan	1704	2 9/16	1596	2 9/16
144½	145	Feb	1309	16¼	497	15½
144½	150	Jan	5534	15/16	3496	6⅛
144½	150	Feb	1989	13½	2097	18⅜
144½	155	Jan	3657	⅜	1498	10⅞
144½	155	Feb	638	12	106	22⅛
144½	160	Jan	2727	⅛	426	16
144½	160	Feb	1314	10⅛	192	24⅝
144½	165	Jan	585	1/16	14	20⅛

Option/Strike	Exp.	Call Vol.	Call Last	Put Vol.	Put Last
144½	165	Feb	442	8¼	4	28⅝
144½	170	Jan	494	1/16	25	26
144½	170	Feb	459	7	35	32
144½	175	Feb	540	6½	69	35¾
144½	185	Feb	1091	4⅝	20	45
AmBankrs	50	Feb	410	2⅝	...	...
AmExpr	95	Jan	358	3/16	795	37⅜
95 15/16	100	Feb	90	3½	909	7⅜
Am Hom	50	Jan	861	5½	10	1/16
54¾	50	Feb	610	6	...	...
54¾	55	Jan	1023	½	32	½
AmIntG	80	Feb	1200	20⅛	...	...
98 11/16	90	May	85	15¾	350	5
AmIntGr o	80	Jan	800	19½	...	...
AppleC	17½	Jan	959	1/16	40	3⅛
41⅜	30	Jan	341	11¼	...	...
41⅜	35	Jan	398	6½	20	1/16
41⅜	40	Jan	3308	1 11/16	537	⅜
41⅜	40	Feb	1247	4½	660	2⅞
41⅜	40	Apr	501	6¾	167	4⅜
41⅜	42½	Feb	587	3½	161	4⅛
41⅜	42½	Jan	1101	½	458	1⅜
41⅜	42½	Feb	587	3½	161	4⅛
41⅜	42½	Apr	232	5⅜	724	5⅞
41⅜	45	Jan	3205	3/16	290	3¼
41⅜	45	Feb	4536	2 9/16	358	5⅜
41⅜	45	Apr	466	4⅜	20	6⅝
41⅜	47½	Jan	959	1/16	40	3⅛
41⅜	47½	Feb	739	1 13/16	39	7¼
41⅜	50	Feb	830	1¼	30	7½
ApplMg	5	Jan	620	2⅝	...	...
7¾	5	Apr	600	3/8	46	½
7¾	10	Apr	890	13/16	112	3⅜
AplMat	40	Jan	380	13⅝	100	1/16
53¼	55	Jan	438	7/16	375	2⅜
AscendC	70	Jan	444	12⅜	20	⅛
82⅛	70	Feb	385	14¼	685	17⅛
82⅛	70	Mar	45	16	346	3⅜
82⅛	75	Jan	748	7	10	1/16
82⅛	75	Feb	532	10⅞	368	3½
82⅛	80	Jan	3997	2⅛	217	5/16
82⅛	80	Feb	898	7½	244	5⅛
82⅛	85	Feb	625	5¼	28	7⅜
82⅛	85	Mar	383	7	12	9
AtHome	110	Jan	387	1⅝	17	8½
Atl R	70	Feb	400	1 5/16	20	9½
60 9/16	70	Feb	400	1 5/16	20	9½
AutoDt	37½	Feb	626	1⅞	7	2⅛
Avon	37½	Jan	226	9/16	620	1
BEA Sys	12½	Jan	585	1 1/16	...	...
13 9/16	17½	Mar	379	1 3/16	...	...
BMC Sft	35	Jan	...	...	500	⅜
37¾	35	Feb	55	5⅞	584	2¾
37¾	45	Feb	152	2 1/16	442	9¾
Baan	15	Jan	...	...	425	2⅝
BancOne	50	Feb	330	5⅜	435	1¼
52 15/16	55	Jan	529	1/8	3	¾
BkTokyoM	10	Aug	1120	2 5/16	...	...
BankAm	40	Jan	2532	22	...	...
62 7/16	60	Jan	615	3	2110	⅜
62 7/16	60	Feb	361	5⅝	305	3
62 7/16	65	Jan	452	5/16	1129	2⅞
62 7/16	65	Feb	3680	3/16	4739	5½
62 7/16	70	Jan	...	...	413	7¾
62 7/16	70	Feb	395	1⅜	35	9⅜
BkBost	35	Feb	32	3¾	588	2 1/16

Option/Strike	Exp.	Call Vol.	Call Last	Put Vol.	Put Last
BkrsTr	85	Feb	10	2 7/16	598	2¾
BarNbl	40	Jan	362	½	99	1¼
39⅜	40	Feb	464	3⅜	33	4
BarickG	20	Jan	741	3/16	327	5/16
bynd.com	40	Jun	414	9½	...	...
BioPharm	30	Feb	...	...	500	3⅝
Biogen	80	Jan	405	10⅝	40	3/16
90¼	90	Jan	1658	1¾	38	1½
90¼	90	Feb	754	6	19	6
Biovail	30	Jul	955	13	10	2⅞
Block	45	Jan	806	1⅛	760	1 7/16
43⅞	45	Feb	750	1 9/16	760	2¼
Boeing	35	Jan	594	1/8	403	1⅝
33 7/16	35	Feb	691	1⅛	137	2⅜
33 7/16	40	Jan	3	1/16	491	6½
33 7/16	40	Feb	354	3/8	10	6⅝
BostBeer	12½	Mar	584	⅞	...	...
BostChkn	5	Jan	...	...	13982	4⅜
BostSc	20	Jan	556	3⅞	364	1/8
24	25	Jan	635	¼	314	15/16
Broadcom	140	Jan	573	1¾	25	5¾
CBS Cp	32½	Jan	535	2 1/8	...	...
34⅜	35	Jan	712	3/8	625	1⅝
34⅜	37½	Feb	179	1⅛	500	3½
CMGI	67½	Mar	401	40¾	...	...
105	70	Jan	385	35	...	...
Cendant	15	Jan	1140	4½	10	1/16
19½	17½	Jan	708	2 1/16	10	⅛
19½	17½	Feb	1197	2¾	839	⅝
19½	20	Jan	2317	⅛	399	⅝
19½	20	Feb	1101	1 7/16	659	1⅝
19½	25	Feb	373	¼	...	...
Centocor	40	Jan	1011	¼	186	⅞
39 9/16	40	Feb	37	3⅛	435	3⅛
39 9/16	45	Jan	11	1/16	388	5¼
Cephln	10	Jan	685	3/8	...	...
10 1/16	10	May	750	3⅛	8	1⅞
Chase n	60	Feb	20	11⅛	497	11 1/16
68⅛	65	Jan	294	3½	844	9/16
68⅛	65	Feb	1709	6⅞	714	3
68⅛	70	Jan	2685	9/16	339	11 3/16
68⅛	70	Feb	694	4¼	553	5⅝
68⅛	75	Feb	875	2	144	8⅜
ChinaTlc	35	Jun	1700	4⅞	...	...
Chiron	25	Jan	608	1/16	54	1⅝
Chrysler o	60	Jan	679	3¾	...	...
CienaCp	15	Jan	2101	3⅝	366	1/16
18 11/16	15	Feb	388	4¾	149	15/16
18 11/16	17½	Jan	3014	1½	221	⅛
18 11/16	17½	Feb	1083	3⅝	143	1¾
18 11/16	20	Jan	7814	⅜	222	1 9/16
18 11/16	20	Feb	1798	2¼	12	3⅜
18 11/16	22½	Jan	970	1/16	10	4⅛
18 11/16	22½	Feb	606	1⅜	10	4¾
Circus	15	Mar	410	¼	142	2⅝
Cisco	50	Apr	500	49⅝	20	⅝
96⅜	85	Feb	284	15¼	378	3¼
96⅜	90	Jan	274	6¾	370	¼
96⅜	90	Feb	596	11½	623	5⅛
96⅜	90	Apr	423	15⅞	73	8⅛
96⅜	95	Jan	1865	2⅝	1883	⅞
96⅜	95	Feb	592	9	554	6⅜
96⅜	100	Jan	3951	½	559	4
96⅜	100	Feb	2884	6⅝	421	9½
96⅜	100	Apr	812	10	36	11⅝
96⅜	105	Jan	1017	⅛	91	8⅞

Option/Strike	Exp.	Call Vol.	Call Last	Put Vol.	Put Last
96⅜	105	Feb	1653	4¾	168	11⅞
96⅜	110	Feb	1062	3⅜	79	15¼
96⅜	110	Apr	915	6¾	...	...
96⅜	110	Jul	402	11	...	...
96⅜	115	Feb	677	2¼	...	...
Citigroup	45	Jan	217	5¾	523	1/16
50½	45	Feb	194	7¼	697	1½
50½	47½	Feb	54	5½	624	2 1/16
50½	47½	Mar	69	6¾	480	2¾
50½	50	Jan	3003	⅝	4177	⅝
50½	50	Feb	675	4	1270	3¼
50½	50	Mar	291	4⅞	4447	4
50½	55	Jan	1098	1/16	659	4¼
50½	55	Feb	1865	1⅞	803	6
50½	55	Mar	510	2⅞	118	6½
50½	60	Feb	1062	13/16	9	10⅛
50½	60	Mar	447	1⅝	21	10⅛
ClearCh	50	Apr	635	12⅜	...	...
Clorox	110	Jan	324	⅜	1493	1¾
108 9/16	115	Jan	690	1/16	25	6⅜
Coke	55	Feb	3	9½	1795	¾
63 11/16	60	Jan	344	3¼	246	3/16
63 11/16	60	Feb	221	5¾	896	1½
63 11/16	65	Jan	481	3/16	1354	1¼
63 11/16	65	Feb	278	2½	1609	3¼
63 11/16	70	Feb	357	¾	220	6¾
CmpUSA	12½	Feb	59	1 3/16	755	1¼
12⅜	20	Feb	...	...	500	7⅝
Compaq	5	Jan	769	1/16	13	2⅝
44 9/16	30	Jan	1021	14⅝	...	...
44 9/16	35	Jan	1371	9¾	...	...
44 9/16	35	Apr	362	11½	197	1¼
44 9/16	37½	Jan	418	7 1/16	...	...
44 9/16	37½	Feb	60	8⅜	397	1
44 9/16	40	Jan	2640	4¾	20	1/16
44 9/16	40	Feb	618	6⅜	279	17/16
44 9/16	42½	Jan	739	2¼	384	3/16
44 9/16	45	Jan	5380	7/16	1552	⅞
44 9/16	45	Feb	1653	3½	410	3⅜
44 9/16	45	Apr	760	5 1/16	76	4⅝
44 9/16	47½	Feb	368	2½	5	4⅝
44 9/16	50	Feb	1557	11 1/16	69	6
44 9/16	50	Apr	634	3 1/8	...	...
44 9/16	50	Jul	542	4⅞	68	8¾
44 9/16	55	Feb	437	13/16	...	...
CompAssoc	40	Jan	401	4⅝	355	1/16
44⅝	45	Jan	550	7/16	384	⅞
44⅝	55	Feb	625	½	...	...
Cmpuwr	70	Feb	391	5	13	7¼
66 13/16	75	Feb	1265	3¼	22	10⅜
Cnseco	35	May	370	3⅛	154	5
CoreLabs	20	Feb	500	3	...	...
Costco	60	Jan	918	11⅜	...	...
72 7/16	65	Apr	1164	10¼	11	3
72 7/16	70	Jan	577	2 9/16	...	...
CumEng	35	Jan	7	1 1/16	1500	⅜
CybrCsh	22½	Jan	504	9/16	...	...
Cymer	15	Feb	100	5¾	407	5/16
20¾	20	Jan	454	⅞	...	...
20¾	20	Feb	463	2⅛	10	1½
DBenz	90	Jan	717	12	457	1/16
DaimlChr	90	Jan	726	11⅝	707	⅛
101 11/16	105	Feb	87	4	504	6⅜
DtBdcst	20	Feb	205	13⅛	364	27/16
31 3/16	20	Mar	623	14⅜	10	3½
31 3/16	22½	Jan	431	9⅛	65	¼

Figure 14.2 Call Option Payoffs

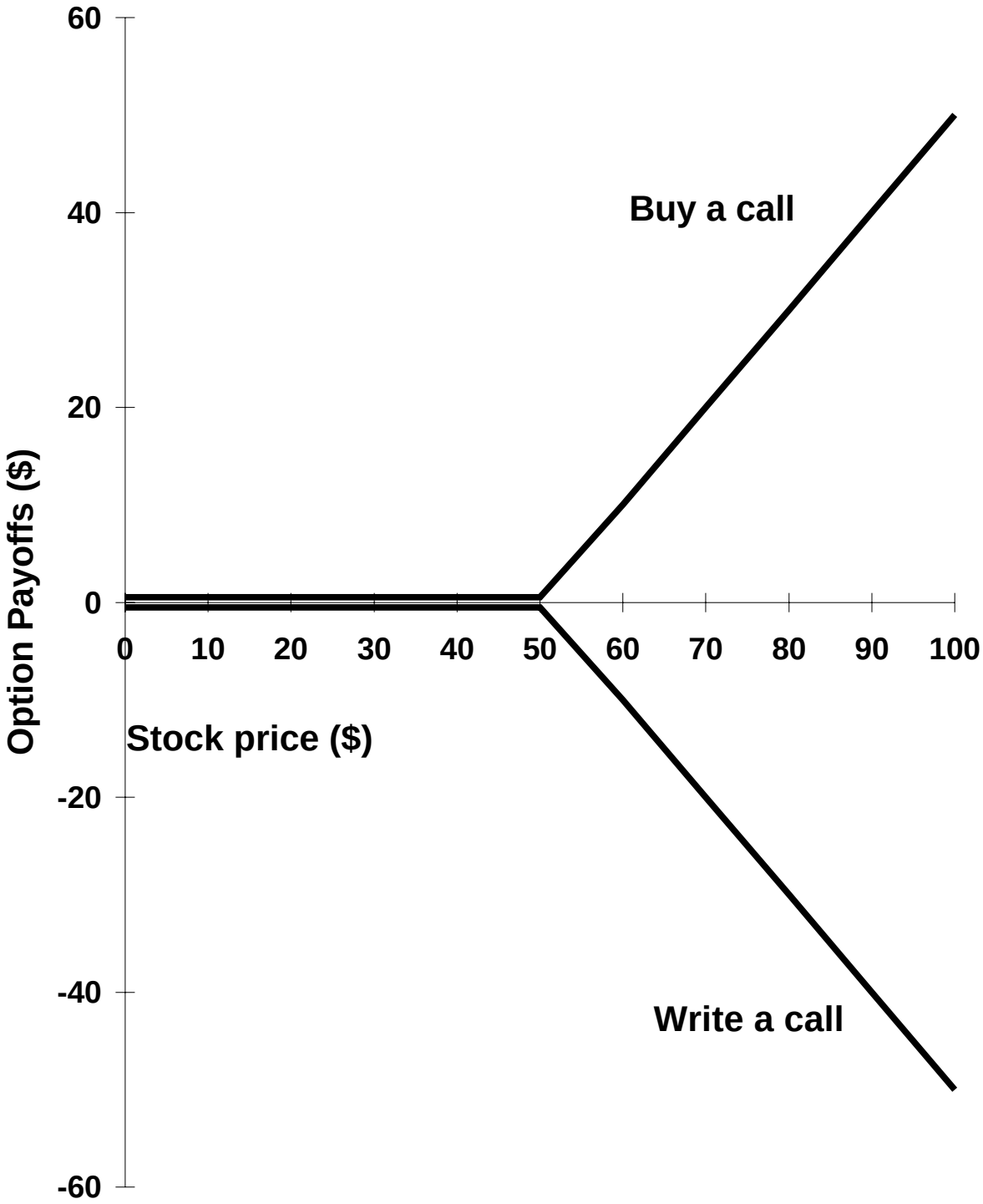

Figure 14.3 Put Option Payoffs

Figure 14.4 Call Option Profits

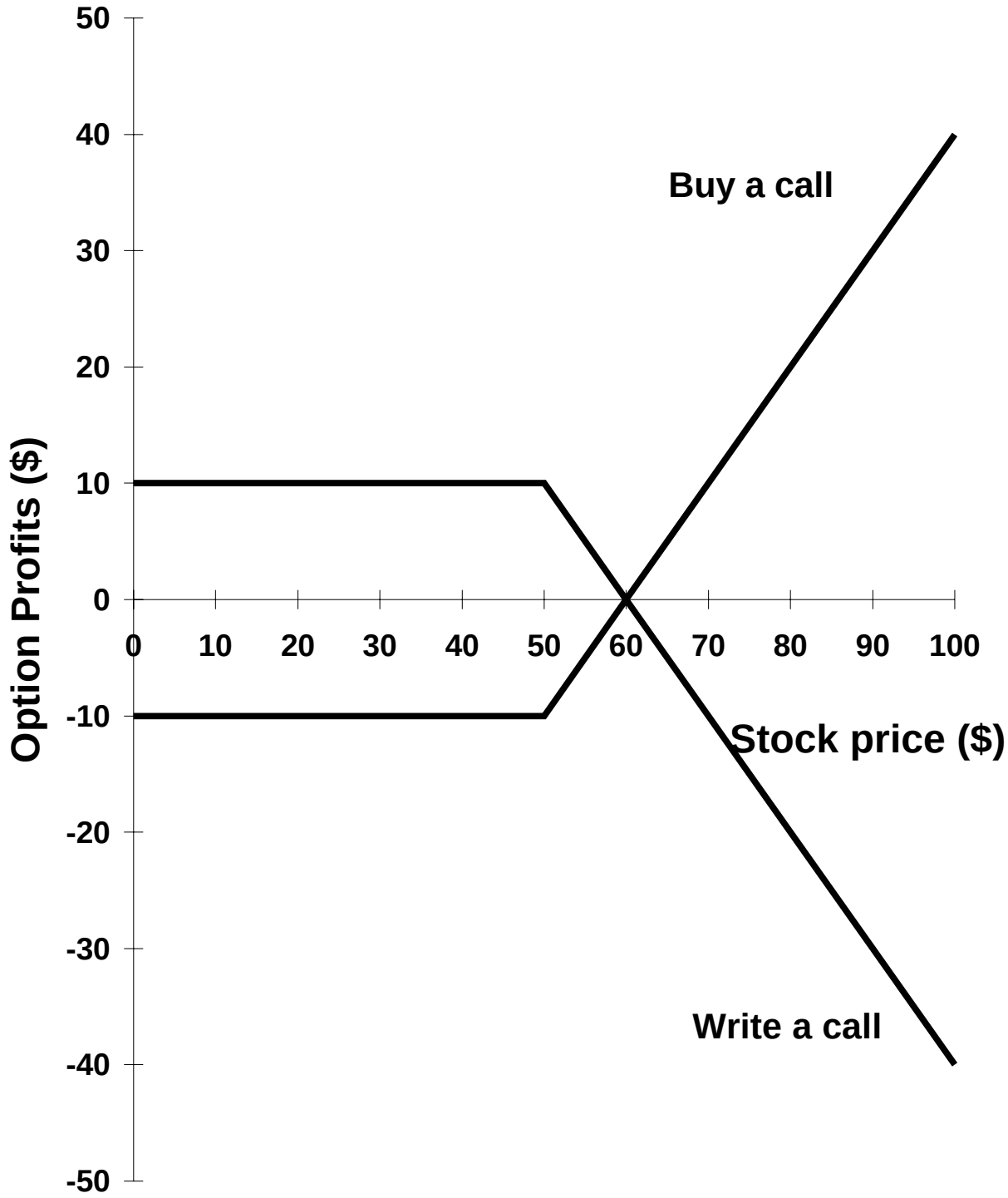

Figure 14.5 Put Option Profits

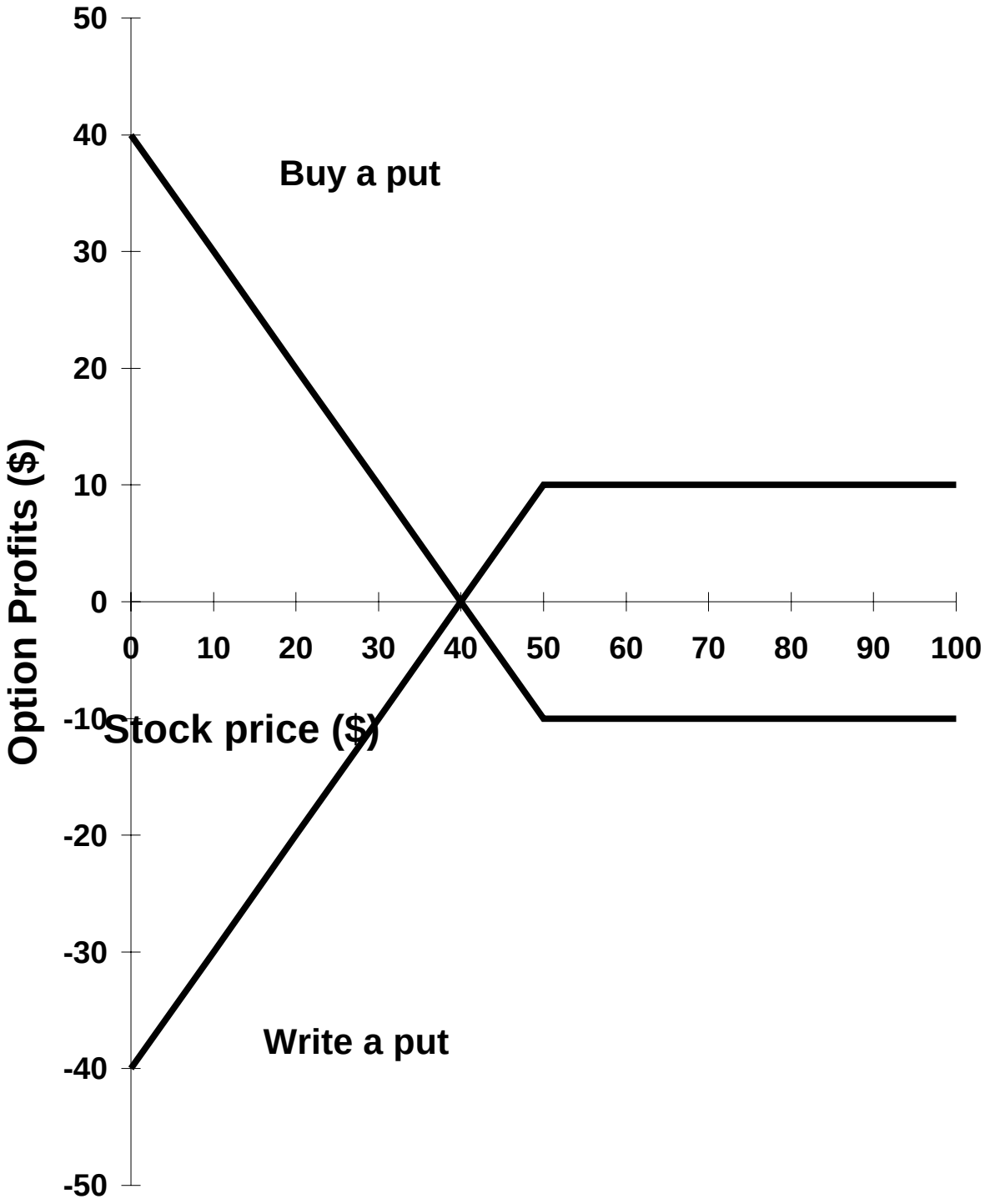

Figure 14.6. INDEX OPTIONS TRADING

Thursday, July 2, 1998

Volume, last, net change and open interest for all contracts. Volume figures are unofficial. Open interest reflects previous trading day. p-Put c-Call

CHICAGO

Strike		Vol.	Last	Net Chg.	Open Int.
CB MEXICO INDEX(MEX)					
Jul	100p	3	1½	– 1	48
Sep	110p	1	10¼	– ⅛	20
Call Vol.		**0**	**Open Int.**		**1,429**
Put Vol.		**4**	**Open Int.**		**251**
CB TECHNOLOGY(TXX)					
Jul	265c	20	17⅜	+ ⅞	20
Jul	285p	10	10½	...	...
Call Vol.		**20**	**Open Int.**		**1,389**
Put Vol.		**12**	**Open Int.**		**1,085**
DJ INDUS AVG(DJX)					
Dec	66p	10	5	– ½	713
Dec	76p	400	11/16	...	46,833
Aug	80p	5	⅜	– 1/16	1,148
Sep	80p	5	⅝	...	14,282
Jul	83p	45	⅛	...	1,675
Jul	84p	20	⅛	– 1/16	4,458
Jul	85p	20	3/16	+ 1/16	878
Jul	86c	11	4½	...	556
Jul	86p	15	⅛	– ⅛	1,557
Sep	86p	18	1½	– ⅛	523
Dec	86p	40	2⅞	– ⅛	165
Jul	87c	7	3½	– ⅜	1,554
Jul	87p	20	5/16	+ 1/16	2,620
Aug	87p	17	1⅛	...	6,025
Jul	88c	5	2 11/16	– 5/16	1,215
Jul	88p	226	5/16	– ¼	4,382
Aug	88c	5	4	+ ⅛	298
Aug	88p	23	1⅜	+ 1/16	558
Sep	88c	2	4¾	– ¼	15,265
Sep	88p	1	11 5/16	– 3/16	5,689
Dec	88p	10	3¼	– ⅛	2,855
Jul	89c	155	2	– 5/16	1,347
Jul	89p	206	⅝	+ ⅛	2,324
Aug	89p	27	1⅝	– ¼	80
Jul	90c	306	1⅜	– 3/16	7,713
Jul	90p	6,357	⅞	+ ⅛	11,752
Aug	90c	27	2⅝	– ¼	672
Aug	90p	341	2	+ 1/16	569
Sep	90c	13	3¾	+ ⅛	2,653
Sep	90p	22	2¾	...	2,739
Jul	91c	30	1 3/16	– 3/16	2,480
Jul	91p	16	1⅜	+ ⅛	998
Aug	91c	60	2	– 1/16	440
Aug	91p	20	2 5/16	– ⅜	105
Jul	92c	78	⅜	– 3/16	3,650
Jul	92p	20	1 15/16	– 1/16	3,174
Aug	92c	60	1 9/16	+ 1/16	992
Aug	92p	2	2¾	– ⅛	984
Sep	92c	3	2⅝	+ ⅜	4,286
Jul	93c	10	¼	...	1,137
Jul	93p	10	2⅞	– ⅜	128
Aug	93c	3	1 3/16	– 3/16	97
Aug	93p	10	3½	...	153
Aug	94c	33	¾	– ⅛	1,115
Aug	94p	5	4	– ⅝	47
Sep	96p	10	5⅝	– ⅞	375
Aug	100p	5	9⅜	– 2⅜	20
Call Vol.		**808**	**Open Int.**		**108,594**
Put Vol.		**7,941**	**Open Int.**		**227,060**
NASDAQ-100(NDX)					
Sep	920p	1	11 5/16	...	...
Sep	930p	6	17⅛	– 7⅜	7
Sep	1080p	2	6⅝	– 1⅜	8
Jul	1160p	20	7/16	– 7/16	145
Jul	1170p	26	7/16	– 9/16	157
Jul	1180c	10	155½	– 25¼	61
Jul	1180p	7	1⅛	+ ¼	492
Jul	1200p	127	1⅜	– ⅝	1,355
Aug	1200p	141	9¾	– ¼	241
Sep	1200p	1	15	– 4	1,357
Jul	1220c	3	120	– 4	1,416
Jul	1220p	52	2	+ ¾	2,676
Aug	1220p	30	12½	– 1	15
Jul	1240c	3	101	– 5½	1,494
Jul	1240p	22	2¾	+ ¼	1,534
Aug	1240p	2	16	+ 1½	75
Jul	1260c	5	91	– 6	974
Jul	1260p	263	4½	+ 1¼	1,680
Aug	1260c	3	102	– 3¼	1
Jul	1280c	8	63	+ 1	779
Jul	1280p	52	7	+ 2⅜	1,233
Aug	1280c	2	89⅜	– 15⅝	150
Aug	1280p	7	22½	+ ⅜	26
Jul	1300c	6	52	– 9	753
Jul	1300p	101	11¼	+ 4	898
Aug	1300c	60	74⅜	– 1⅜	91
Aug	1300p	104	29½	+ 7	311
Jul	1320c	108	33½	– 11½	1,506
Jul	1320p	95	17	+ 6¾	1,045
Aug	1320c	4	61	– 5⅜	217
Aug	1320p	2	34½	– 3½	30
Sep	1320p	200	47	...	4
Jul	1340c	250	21¾	– 11¼	1,252
Jul	1340p	390	24	+ 7¼	499
Aug	1340c	6	47	– 3½	133
Aug	1340p	4	41¾	– 5	30
Sep	1340c	60	65	– 4¼	168
Sep	1340p	5	52	+ 1	155
Jul	1360c	297	10⅞	– 11⅛	695
Jul	1360p	251	34	+ 10	825
Aug	1360c	6	40	– 9	58
Jul	1380c	121	5¼	– 7¼	518
Jul	1380p	6	45	+ 9	138
Aug	1380c	9	28	– 8½	182
Sep	1380c	1	45	+ 4⅛	22
Call Vol.		**1,496**	**Open Int.**		**14,804**
Put Vol.		**1,920**	**Open Int.**		**22,308**
RUSSELL 2000(RUT)					
Jul	425p	3	½	+ ¼	138
Sep	440c	5	30¾	+ 5¾	5,407
Jul	460c	1,056	3⅝	– 2⅜	267
Jul	460p	1,030	4⅞	– 3⅝	100

RANGES FOR UNDERLYING INDEXES

Thursday, July 2, 1998

	High	Low	Close	Net Chg.	From Dec. 31	% Chg.
DJ Indus (DJX)	90.48	90.03	90.25	– 0.24	+ 11.17	+ 14.1
DJ Trans (DTX)	351.42	349.53	350.65	– 0.81	+ 25.00	+ 7.7
DJ Util (DUX)	294.32	292.79	293.84	– 0.30	+ 20.77	+ 7.6
S&P 100 (OEX)	560.60	557.82	559.38	– 1.22	+ 99.44	+ 21.6
S&P 500 -A.M.(SPX)	1148.56	1142.99	1146.42	– 2.14	+ 175.99	+ 18.1
CB-Tech (TXX)	282.55	275.84	277.35	– 5.20	+ 61.56	+ 28.5
CB-Mexico (MEX)	103.01	101.99	102.57	– 0.33	– 24.41	– 19.2
CB-Lps Mex (VEX)	10.30	10.20	10.26	– 0.03	– 2.44	– 19.2
MS Multintl (NFT)	636.03	632.61	633.94	– 2.09	+ 102.39	+ 19.3
GSTI Comp (GTC)	183.71	179.85	180.23	– 3.48	+ 36.77	+ 25.6
Nasdaq 100 (NDX)	1356.14	1331.84	1332.53	– 23.61	+ 341.73	+ 34.5
NYSE (NYA)	586.08	584.08	585.80	+ 0.20	+ 74.61	+ 14.6
Russell 2000 (RUT)	459.85	457.91	458.31	– 1.51	+ 21.29	+ 4.9
Lps S&P 100 (OEX)	112.12	111.56	111.88	– 0.24	+ 19.89	+ 21.6
Lps S&P 500 (SPX)	114.86	114.30	114.64	– 0.21	+ 17.60	+ 18.1
S&P Midcap (MID)	366.32	365.07	365.42	– 0.24	+ 32.05	+ 9.6
Major Mkt (XMI)	960.41	954.45	956.39	– 4.02	+ 119.54	+ 14.3
HK Fltg (HKO)	172.76	172.71	172.71	+ 6.42	– 41.85	– 19.5
IW Internet (IIX)	396.38	385.60	390.24	– 4.76	+ 129.99	+ 50.0
AM-Mexico (MXY)	113.86	112.31	113.66	+ 0.79	– 27.87	– 19.7
Institut'l -A.M.(XII)	645.27	642.46	644.41	– 0.50	– 405.75	– 38.6
Japan (JPN)	.....	.....	170.39	+ 1.16	+ 12.75	+ 8.1
MS Cyclical (CYC)	521.91	517.08	519.66	– 2.25	+ 44.65	+ 9.4
MS Consumr (CMR)	525.13	522.57	524.89	+ 0.94	+ 79.25	+ 17.8
MS Hi Tech (MSH)	608.08	591.64	596.38	– 11.70	+ 148.86	+ 33.3
Pharma (DRG)	676.84	672.43	676.62	+ 2.97	+ 142.88	+ 26.8
Biotech (BTK)	145.33	142.24	142.44	– 2.34	– 19.98	– 12.3
Comp Tech (XCI)	569.38	558.18	558.45	– 10.93	+ 119.46	+ 27.2
Gold/Silver (XAU)	70.15	68.35	68.80	– 1.93	– 5.39	– 7.3
OTC (XOC)	980.51	964.32	965.14	– 15.37	+ 227.19	+ 30.8
Utility (UTY)	327.09	325.12	326.11	– 0.98	+ 16.08	+ 5.2
Value Line (VLE)	958.08	955.16	956.62	– 1.46	+ 79.78	+ 9.1
Bank (BKX)	881.61	872.21	880.89	+ 5.36	+ 125.54	+ 16.6
Semicond (SOX)	252.75	245.24	245.61	– 7.14	– 18.02	– 6.8
Top 100 (TPX)	1104.79	1100.38	1103.40	– 0.92	+ 193.78	+ 21.3
Oil Service (OSX)	92.53	89.47	92.04	+ 2.43	– 22.33	– 19.5
PSE Tech (PSE)	350.20	343.88	345.21	– 5.04	+ 54.65	+ 18.8

Strike		Vol.	Last	Net Chg.	Open Int.
Aug	460c	1	9¾	– 1¼	52
Sep	460c	500	13	– 2½	2,194
Sep	460p	500	12	+ 1	2,202
Jul	465c	10	2¼	– 1¼	449
Aug	465c	1	7⅜	– 1¾	13
Sep	470p	2	14⅜	– 1	1,500
Sep	475c	2	7¼	...	...
Sep	480c	1	5¼	+ ⅞	350
Sep	495c	70	1⅝	...	...
Call Vol.		**1,646**	**Open Int.**		**16,004**
Put Vol.		**1,535**	**Open Int.**		**23,156**
S & P 100 INDEX(OEX)					
Jul	460p	305	1/16	– 1/16	10,206
Jul	470p	196	⅛	– ⅛	9,157
Aug	470p	54	15/16	– ⅛	2,875
Sep	470p	5	2	– ½	730
Jul	480c	25	81	+ 5⅛	69
Jul	480p	90	3/16	– 1/16	9,422
Aug	480p	45	1¼	– ⅛	2,495
Sep	480p	10	2⅞	...	1,314
Oct	480p	10	4¼	– ½	264
Jul	490p	45	¼	– 1/16	11,378
Aug	490p	111	1⅝	– ¼	5,740
Jul	500p	281	5/16	– 1/16	24,294
Aug	500p	7	2 5/16	– 1/16	1,907
Sep	500p	42	4¼	– ½	1,357
Oct	500p	11	6½	– 1	159
Jul	505p	68	⅜	– ⅛	6,273
Jul	510c	1	50⅝	+ 3⅜	644
Jul	510p	296	½	...	24,516
Aug	510p	101	3	...	1,770
Sep	510p	25	5¼	– 2⅜	515
Jul	515p	352	9/16	– ⅛	5,010
Aug	515p	20	3¼	– ¼	553
Jul	520c	15	41	– ½	3,074
Jul	520p	1,045	11/16	– 1/16	9,797
Aug	520p	46	4	...	2,500
Jul	525c	51	37⅛	+ 13⅜	2,377
Jul	525p	986	13/16	– 1/16	9,578
Sep	525p	25	7¾	– 2¼	310
Jul	530c	62	30¾	– 1⅛	7,539
Jul	530p	2,167	11/16	– 1/16	15,891
Aug	530p	111	5	– ⅞	2,826
Sep	530p	115	8⅝	– ½	2,833
Oct	530p	150	11½	– 1¾	802
Jul	535c	181	26	– 1	10,094
Jul	535p	1,377	17/16	– 1/16	13,351
Aug	535p	9	6	– ¾	328
Jul	540c	522	23	– ¾	8,272
Jul	540p	2,526	1 13/16	– 3/16	14,744
Aug	540c	57	28½	+ ¼	5,750
Aug	540p	302	6⅞	...	10,450
Sep	540p	1	10½	– ½	2,546
Jul	545c	414	18½	– ½	6,701
Jul	545p	1,566	2½	– ⅛	12,087
Jul	550c	1,449	14½	– ⅛	10,054
Jul	550p	3,764	3⅜	– 1/16	11,247
Aug	550c	19	21	– 2¼	3,712
Aug	550p	323	9	– 1	2,160

Strike		Vol.	Last	Net Chg.	Open Int.
Sep	550c	2	27	– ½	1,209
Sep	550p	23	13⅝	– 1/16	498
Oct	550c	411	31¾	– ⅜	3,826
Oct	550p	461	17	– ⅝	3,808
Jul	555c	1,363	10½	– ¾	8,435
Jul	555p	3,612	4¾	– 1/16	7,154
Aug	555c	7	18½	– ¾	2,669
Aug	555p	135	11⅜	– 1¼	137
Sep	555c	40	24¼	– ¼	2,488
Sep	555p	46	15¼	– 1½	279
Jul	560c	5,688	7¼	– ½	14,670
Jul	560p	4,705	6½	– ¼	6,513
Aug	560c	123	15½	– ⅝	4,582
Aug	560p	59	13	– 1	363
Sep	560c	17	21½	– 1¼	1,267
Sep	560p	23	17	– 1⅜	418
Oct	560c	4	25⅝	– 1⅝	10
Oct	560p	9	20⅛	– 2⅞	7
Jul	565c	2,327	4⅝	– ⅜	12,390
Jul	565p	1,313	9⅛	...	1,288
Aug	565c	74	12¼	+ ¾	4,974
Aug	565p	6	15⅛	– 2⅞	12
Jul	570c	3,554	2 11/16	– 7/16	11,291
Jul	570p	95	12¾	+ ¼	630
Aug	570c	52	9⅝	– ⅞	6,523
Aug	570p	5	18	+ ½	127
Sep	570c	10	15⅛	– ½	992
Sep	570p	1	21¼	– 2¾	137
Oct	570c	6	20¼	– ¼	295
Oct	570p	3	24⅞	– 3⅜	88
Jul	575c	2,410	17/16	– 5/16	6,672
Aug	575c	15	7½	+ ⅛	352
Aug	575p	10	21¼	...	...
Jul	580c	1,240	¾	– 3/16	7,797
Jul	580p	14	20	– 1	350
Aug	580c	202	5¾	...	7,269
Sep	580c	41	11	– ⅛	1,178
Sep	580p	170	27¼	– 2¾	222
Oct	580p	1	31⅛	– 1⅞	35
Aug	585c	7	4⅜	...	...
Jul	590c	655	¼	– 1/16	7,866
Aug	590c	426	3⅛	– ⅛	2,229
Sep	590c	3	6¾	– ⅛	2,348
Oct	590c	3	11	...	1,027
Jul	600c	130	⅛	...	4,655
Aug	600c	101	1½	– 3/16	3,487
Call Vol.		**21,708**	**Open Int.**		**196,659**
Put Vol.		**27,730**	**Open Int.**		**261,916**
S & P 500 INDEX-AM(SPX)					
Sep	700c	3	452½	+ ¾	1,259
Sep	775p	1	½	– ½	1,209
Sep	850p	2	15/16	+ 1/16	4,672
Jul	900p	12	⅛	...	10,197
Aug	900p	1,660	⅞	...	9,340
Jul	950p	5	3/16	...	5,914
Aug	950p	2	1⅝	– ½	2,419
Sep	950p	165	3⅜	– ½	19,267
Jul	975p	5	5/16	...	6,717
Jul	995p	1	½	– ⅛	3,259

Strike		Vol.	Last	Net Chg.	Open Int.
Sep	995p	302	6	– ⅛	23,726
Jul	1005p	39	¼	– 5/16	6,529
Aug	1005p	60	3⅛	– ⅛	1,579
Jul	1020c	525	127	...	1,532
Jul	1020p	20	½	– ¼	1,369
Jul	1025p	20	½	– ⅞	9,198
Aug	1025p	210	4	– ¼	6,158
Sep	1025p	14	7¾	– 1¼	14,972
Jul	1035p	20	⅝	– ⅞	790
Jul	1040p	205	¾	– ⅝	808
Jul	1050c	301	98¼	– 1¾	608
Jul	1050p	425	15/16	...	16,045
Aug	1050c	800	107½	+ 10½	34
Aug	1050p	390	5¾	– ½	3,888
Sep	1050p	452	10½	– 1¼	31,940
Jul	1055p	7	¾	– ¾	193
Jul	1060p	8	1⅛	– ⅜	2,627
Sep	1060p	113	11½	– 5½	986
Jul	1070c	200	78	+ 23	539
Jul	1070p	451	1¼	+ 1/16	5,492
Jul	1075p	190	1½	– ⅜	15,053
Aug	1075c	25	84	+ 26¾	22
Aug	1075p	604	8½	– 1½	3,871
Sep	1075p	227	14¾	+ ¾	24,440
Jul	1080p	370	1½	– ½	4,951
Sep	1080p	10	15½	– ⅝	285
Jul	1090p	112	2	– ½	10,906
Aug	1090p	211	10⅛	– ⅝	2,777
Sep	1090p	2,100	17	– 1¾	487
Jul	1095p	53	2¼	– ½	5,633
Sep	1095p	983	17¼	– 2¼	3,031
Jul	1100c	309	49⅞	– 3⅛	16,777
Jul	1100p	562	2½	– ½	21,417
Aug	1100c	200	64	+ 1	5,194
Aug	1100p	911	11½	– ¼	10,665
Sep	1100c	18	73½	+ 2¼	26,972
Sep	1100p	304	18¾	– 2¼	31,723
Jul	1105p	2	3	– 1⅝	1,713
Jul	1110c	408	41½	– 1½	9,530
Jul	1110p	633	3¾	– ½	6,058
Aug	1110p	80	14¼	– 1¾	514
Jul	1115c	1	37	– 1	3,978
Jul	1115p	2	4⅛	– 1⅞	5,026
Jul	1120c	1,592	32¾	– 1¾	8,617
Jul	1120p	340	5	– 1⅛	8,550
Aug	1120p	4	16½	– 3⅛	310
Jul	1125c	187	30	– 1	6,948
Jul	1125p	149	5¾	– ¼	5,367
Aug	1125c	43	46	+ 6¼	2,120
Aug	1125p	96	17⅞	– 1⅛	2,182
Sep	1125c	18	53½	– 1	19,256
Sep	1125p	367	26	+ ½	16,137
Jul	1130c	123	25	– 2	5,115
Jul	1130p	201	6⅝	– 1	2,029
Aug	1130p	36	19¼	– ½	4,745
Sep	1130p	3	27	– 2¼	825
Jul	1135c	66	20¼	– 2¾	547
Jul	1135p	22	8½	– 1½	350
Jul	1140c	707	17¾	– 1	12,874
Jul	1140p	917	9¼	– ¾	6,387
Aug	1140c	414	34¼	+ 1¼	591
Aug	1140p	41	22⅞	– ⅛	798
Sep	1145c	125	43	– 1	2,205
Sep	1145p	627	31½	+ ½	2,205
Jul	1150c	1,175	12¼	– ¾	10,783
Jul	1150p	231	13	– 1¼	2,591
Aug	1150c	3,241	27¾	– 2¼	4,383
Aug	1150p	1,826	26	– 1	2,364
Sep	1150c	641	40	– 1	19,149
Sep	1150p	739	34	...	13,851
Jul	1155c	69	9	– 2	2,510
Jul	1155p	11	15⅞	– ¾	3
Jul	1160c	1,236	7	– 1	6,176
Jul	1160p	32	20½	+ 1⅜	487
Aug	1160c	7	23	+ 1¼	1,675
Sep	1160c	314	34	– 1	155
Sep	1160p	354	38	...	147
Jul	1165c	866	5¾	+ ⅝	2,145
Sep	1165c	19	31	+ 8	15
Jul	1170c	471	4⅛	– 1¼	8,705
Jul	1170p	9	27	– 1⅞	235
Aug	1170c	25	18	– 1	867
Aug	1170p	200	35½	– 1	40
Sep	1175c	16	26	– 1½	8,345
Sep	1175p	150	45⅞	– ⅛	1,239
Jul	1180c	679	2	– ⅝	8,222
Jul	1180p	12	34½	+ 2	468
Aug	1180c	206	14	+ ½	914
Aug	1190c	13	9½	– 2	587
Aug	1190p	1	48½	– 2½	2
Jul	1200c	136	7/16	– 5/16	3,849
Jul	1200p	8	53½	– 7⅜	27
Aug	1200c	21	7	– 2	4,202
Aug	1200p	5	55½	– 41½	3
Sep	1200c	170	15¾	+ ½	15,765
Aug	1225c	2	2½	– ½	107
Sep	1225c	2,078	8¾	– ¼	3,746
Jul	1250c	62	1/16	– 1/16	2,548
Jul	1250p	200	104	– 1	1,101
Sep	1250c	19	4⅝	– ⅝	14,953
Sep	1300c	129	15/16	– 1/16	5,395
Sep	1300p	525	142½	...	2,102
Call Vol.		**22,343**	**Open Int.**		**779,410**
Put Vol.		**26,543**	**Open Int.**		**1,179,862**