

Chapter 5

Option Strategies

Chapter 4 was concerned with the basic terminology and properties of options. This chapter discusses categorizing and analyzing investment positions constructed by meshing puts and calls with their underlying securities. Options may be used to produce payouts that best reflect the expectations that an investor has for the future prospects of a security. As an example, consider an investor who believes that a news announcement will soon be released that will have major ramifications on the price of the stock of a particular company. Since it is not known whether the announcement will be good or bad, the investor is uncertain whether to buy or sell the security. We shall see that, by using options, a position can be constructed so that profits will be obtained provided the news announcement results in large price moves, positive or negative.

As a second example, consider an investor who attempts to “time” the market. Without options, such investors attempt to smooth out the fluctuations of their portfolio values by buying and selling their securities. Anticipating short-term declines in stock price, an investor may choose to sell the security, even if he believes the long-term prospects appear good. Timing strategies can result in large transaction costs. With options, the anticipated short-term decline can be hedged without selling the stock. In fact, with options available, investors can choose precisely the degree of risk they want to bear. Unwanted risk associated with some aspects of stock ownership can be transferred to others who are willing to accept it.

In this chapter we shall consider a variety of option strategies that produce distinctive future payouts. For the most part, we shall ignore commissions, margin requirements, and dividends. We shall also assume that positions are maintained unchanged to the expiration date and that no premature exercising occurs.

The primary objectives of this chapter are the following:

- To analyze almost any position containing several option contracts on a single underlying security;
- To recognize the strategic role of options in investment management; and
- To identify the most popular stock option strategies currently in use.

Option Positions

There are four types of option positions:

- *Naked positions* involve the purchase or sale of a single security, for example, the purchase or sale of a stock or a call or a put.
- *Hedge positions* consist of the underlying stock together with options that provide partial or full protection from unfavorable outcomes.
- *Spread options* consist of a long position in one option and a short position in another option on the same underlying security.
- *Combinations* consist of portfolios containing either long or short positions in call and put options on the same security.

Exhibit 1 shows the price data that will be used to illustrate all the strategies discussed in this chapter.

Exhibit 1
Option Prices

Strike	Calls			Puts		
	Near (April)	Middle (July)	Far (October)	Near (April)	Middle (July)	Far (October)
25	15.06	–	–	0.06	–	–
30	10.88	12.12	–	0.25	0.75	–
35	7.00	8.62	–	1.0	1.95	–
40	4.00	5.75	7.38	3.00	3.88	4.50
45	2.00	3.69	5.39	10.00	10.06	10.25

Stock Price	\$40.0
Time to April Expiration	12 Weeks

Naked Positions in the Stock

Exhibit 2 illustrates the profit diagram for holding the stock for three months. Increases in stock price offer profits, whereas decreases in stock price offer losses.

Exhibit 2
Profit for Purchasing Stock

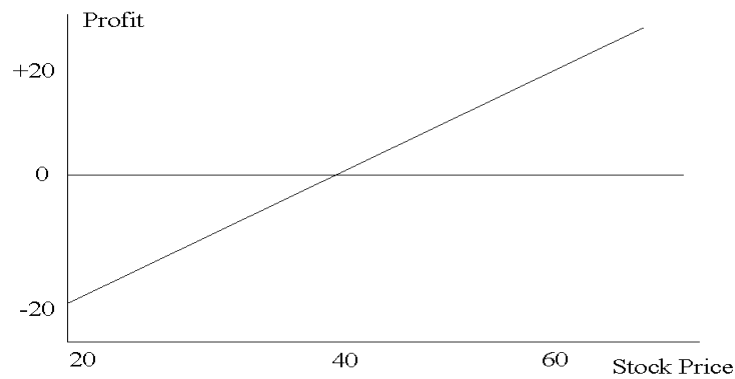


Exhibit 3
Profit for Selling Stock Short

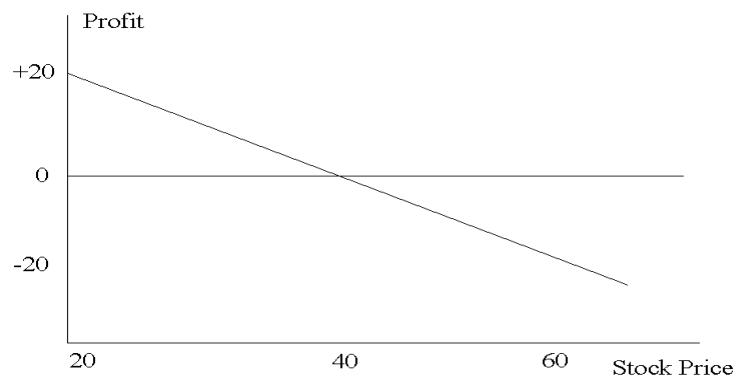


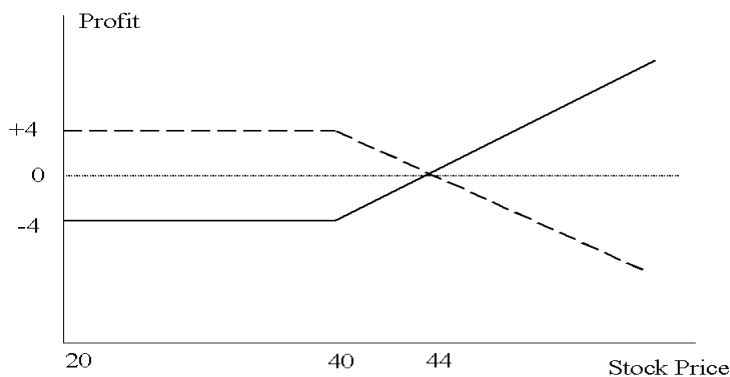
Exhibit 3 illustrates the profit diagram for *selling the stock short*. The short seller, an-

icipating stock declines, intends to return the securities by purchasing them in the future at lower prices. Since the investor is liable for all dividends paid on the stock while it is outstanding, if the investor is to profit, the price declines must be significantly greater than the dividends. For the privilege of borrowing stock, the broker requires the investor to deposit collateral into a special margin account. Specifically, 50 percent of the short sale value must be deposited in cash or in interest-bearing securities with the broker. Furthermore, the proceeds of the sale of the borrowed stock are retained by the broker in a noninterest bearing account until the stock is returned. If the stock moves favorably, some of the margin funds can be released to support other investments. No additional margin is required if the stock moves unfavorably until a lower *maintenance margin* requirement is violated. The details of margin requirements for short sales are discussed in the appendix to this chapter. Exhibit 3 shows the profit increasing as the stock price declines.

Naked Positions in Call Options

The solid line in Exhibit 4 illustrates the profit diagram associated with the strategy of buying a call. The diagram illustrates the payouts associated with buying the three-month at-the-money call contract.

Exhibit 4
Profit for Buying a Call



One of the main attractions of buying call options is that they provide speculators with significant leverage. If the stock price in Exhibit 4 increases by \$20, its return would be 50 percent, while the return on the option would be 400 percent. However, if the stock remained unchanged in price, its return would be 0 percent, compared to a 100 percent loss in the option. Even though the return on the option may be a very large percentage, the risk can never exceed the call premium, which is typically a fraction of the stock price.

The dashed line in Exhibit 4 indicates the profit diagram for the sale of the call. The

naked call writer assumes the prospect of unlimited risk in return for a limited profit. Thus, this strategy is unsuitable for some investors. In Exhibit 4, the naked call writer will profit only if the stock price remains below \$44.

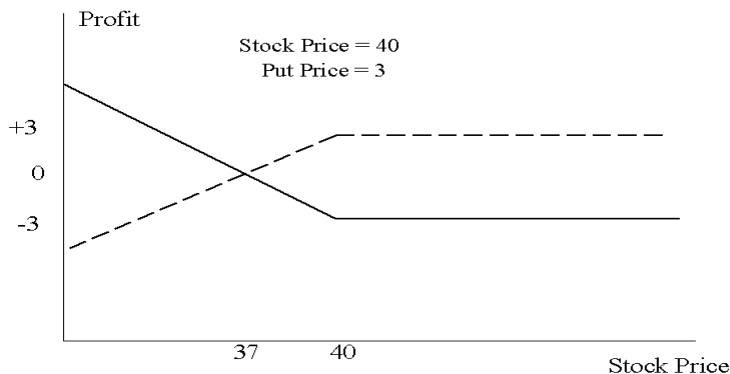
Recall that call writers have an obligation to deliver shares in the event that they are exercised. In order to ensure that the investor is able to deliver the underlying security, the broker will require the call writer to deposit collateral into a margin account. The exact margin requirements are discussed in the appendix to this chapter.

Naked Positions in Put Options

The solid line in Exhibit 5 illustrates the profit diagram associated with the strategy of buying a put option and holding it to expiration. The diagram illustrates the payouts associated with buying the three-month at-the-money put contract.

Like call options, put options are highly leveraged financial instruments. If the stock drops to \$25 (for a net loss of 37 percent), the option would be worth \$15 and its return would be 267 percent. As with call options, the maximum loss is limited to the put premium, which usually is a small fraction of the security price. The dashed line in Exhibit 5 indicates the profit function for the sale of a put.

Exhibit 5
Profit for Buying a Put



Here the maximum profit equals the put premium, while the downside loss is only limited by the fact that the stock cannot drop below zero.

Some investors who actually want to acquire stock will write naked puts. The motivation for this is illustrated by the example below.

Example

An investor feels that XYZ would be a good buy at \$36. With the stock priced at \$40, the investor decides to place an open buy order with a limit price of \$36. Three months later XYZ has drifted down to \$37, but no lower. If the price rises rapidly, the investor will not participate in the rally, since the stock will not be owned.

Rather than place an open order at \$36, the investor could have written a 40 put for \$4. If XYZ is below \$40 at expiration, the put will be exercised and the investor will be forced to pay \$40 per share for the stock. Since \$4 was received from the sale of the put, the net cost of the stock is \$36.

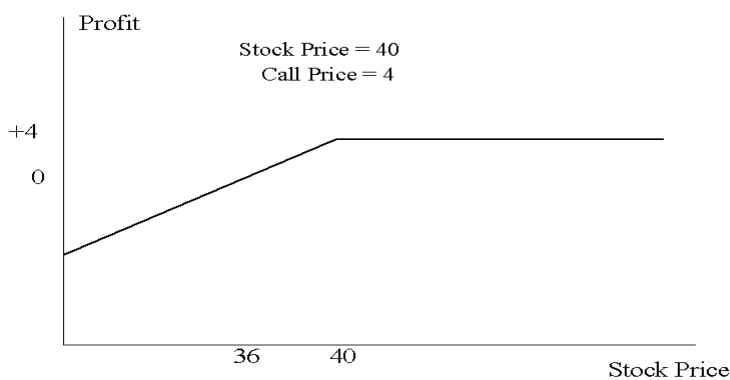
The advantage of writing a put over placing an open buy order is that the strategy generates income when the stock price does not fall to the purchase level.

Hedge Positions

Hedging Stock with Call Options

A covered hedge position (often referred to as a covered write position) consists of a portfolio in which a call is written against every 100 shares held Exhibit 6 shows the profit diagram of a portfolio in which a three-month at-the-money call option is written against the stock.

Exhibit 6
Profit for a Covered Call Position



The solid line in Exhibit 7 illustrates the profit diagram for a covered hedge position in which the April 35 calls are sold against the stock. The profit diagram is compared to the previous position involving the sale of the April 40s.

Note that by selling the 35's rather than the 40's, the investor sacrifices upside potential for downside protection. Specifically, the new position can make a maximum of only \$2 (as opposed to \$4). However, the position loses money only if the stock price falls below \$33 (as opposed to \$36). The choice between these two positions depends on the investor's beliefs about future prices as well as his attitude toward risk and reward.

Exhibit 7
Comparison of Two Covered Call Positions

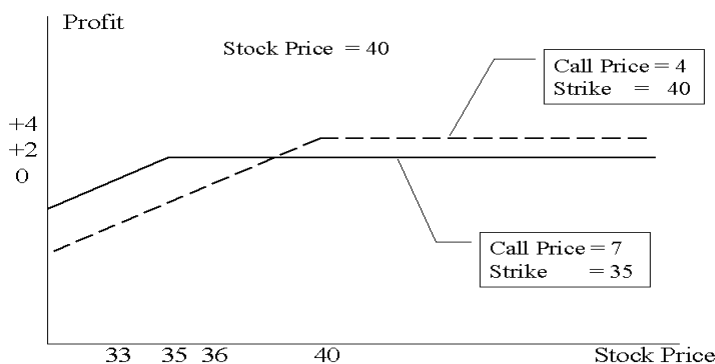
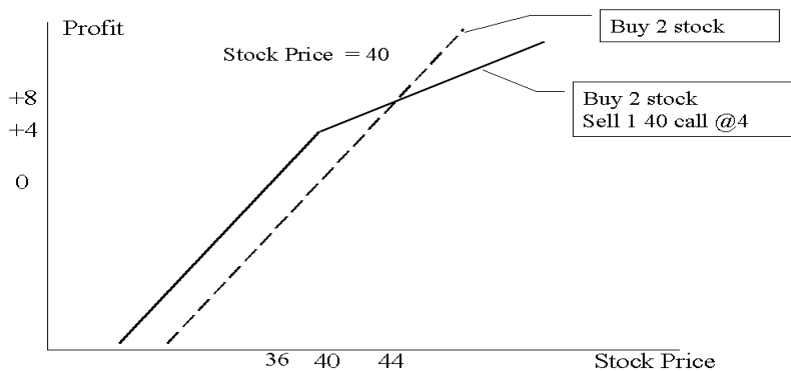


Exhibit 8
A Partially Covered Call Position

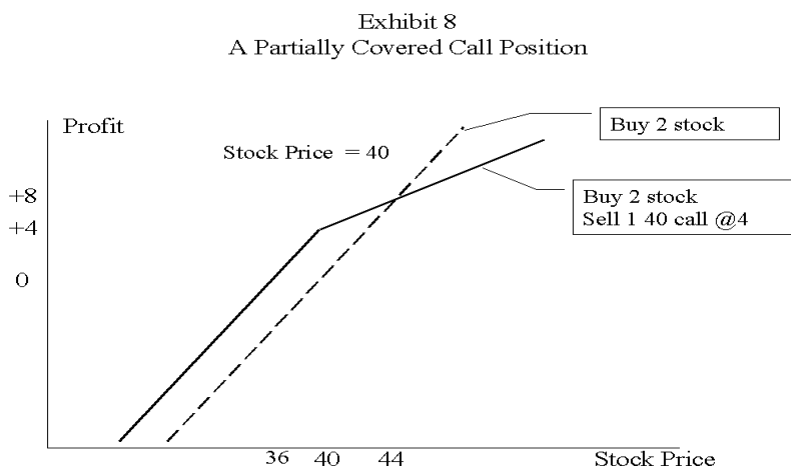


The fact that the option premium acts as partial compensation for potential declines in the underlying stock price has appeal to stockholders who believe that, over the short

term, the stock price will be flat at best. Instead of selling the stock with the intention of buying it back in the future, such stockholders could sell calls against their stock. Indeed, this strategy outperforms stock ownership if the stock price falls, remains the same, or even rises slightly.

A partially covered hedge position can be established by writing fewer calls than stock held. The ratio of calls written to stock held is called the hedge ratio. Exhibit 8 illustrates a 1 : 2 hedge where at-the-money call options are used. The dashed line indicates the profit line for a naked position in two stocks. Note that, unlike the previous position, this partial hedge does not place a ceiling on the upside potential.

To be classified as a hedge, the ratio of calls sold to stock purchased should be close to one. If the number of call options exceeds the number of stock held, the strategy is termed a *ratio write strategy*. Exhibit 9 illustrated the profit diagram for a 2 : 1 ratio write strategy.



The 2:1 ratio write strategy generally will provide larger profits than either the covered write strategy or naked writing if the underlying stock remains relatively unchanged over the life of the call options. However, should the stock price make a significant positive or negative move, losses could be substantial.

Generally, investors who establish a ratio write strategy are neutral in outlook regarding the underlying stock. This means that the at-the-money call is usually used in the strategy.

Note that the profit range in Exhibit 9 extends from \$32 to \$48. Although this interval appears large, the amount of dollars made in it can be small relative to the large losses that can be incurred if the stock price moves out of this range.

Hedging Stock with Put Options

Exhibit 10 shows the profit diagram of a long position in the stock and a put option. Note that losses in the stock price below the strike are offset by increases in the put price. The put acts as an insurance policy providing price protection against stock declines below the strike. Note that this payout looks very similar to the payout of a call option. We shall have more to say about this in the next chapter.

Exhibit 9
A 2:1 Ratio Write Strategy

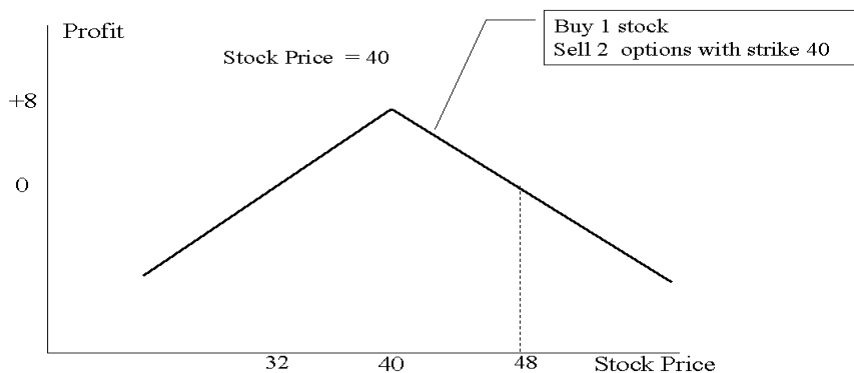
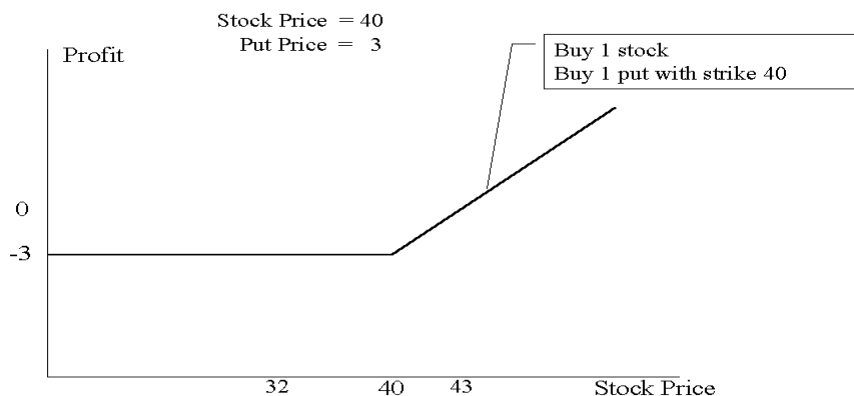


Exhibit 10
Hedging a Stock with a Put



The solid line in Exhibit 11 illustrates the payouts achieved by hedging the stock by purchasing an April 35 put option. The previous profit diagram is also presented as a dashed line so that comparisons between the two alternatives can be made.

By paying \$3, the investor buying the 40 put purchases protection against all price declines below \$40. By paying \$1, the investor buying the 35 put purchases protection against price declines below \$35. By purchasing the cheaper put, the investor is bearing more downside risk. However, this risk is compensated by higher rewards should the stock price rise.

The put contract can be viewed as an insurance policy on the stock price. For a higher premium, an insurance policy that provides better protection against price declines can be obtained.

As with call options, the number of puts purchased against shares owned need not be equal to one. The solid line in Exhibit 12 illustrates a profit diagram for a position with hedge ratios of 1 : 2. That is, one put is purchased for every two shares owned.

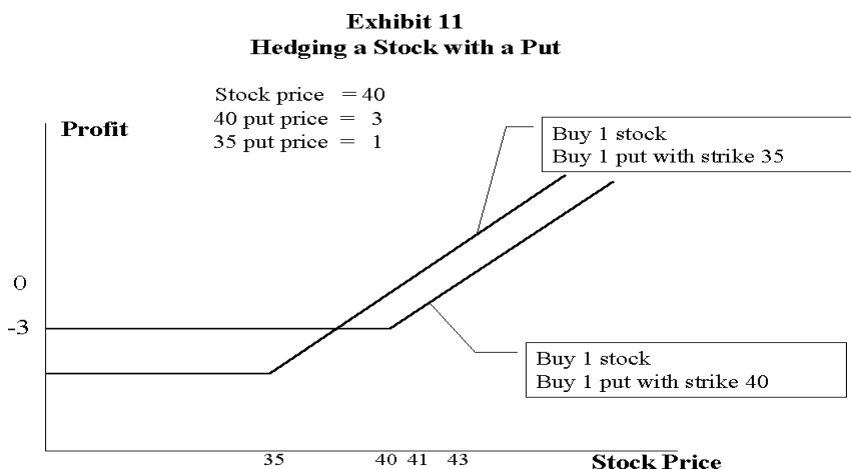


Exhibit 12 compares this strategy to the unhedged strategy of purchasing two shares and to the fully hedged strategy of purchasing two puts with the two shares. Note that the unhedged strategy produces the best results if the stock price appreciates significantly and the worst results if the stock price drops significantly. The fully insured position, on the other hand, performs the best, relatively, when the stock price drops significantly and the worst when the price appreciates. Although the partially hedged position does not truncate all the downside risk below the strike price, it offers more upside potential than the fully insured hedge.

Spreads

Simple spread positions are termed bullish (bearish) if the spread benefits from stock price increases (decreases). Spread positions can be categorized into three types: vertical, horizontal, and diagonal.

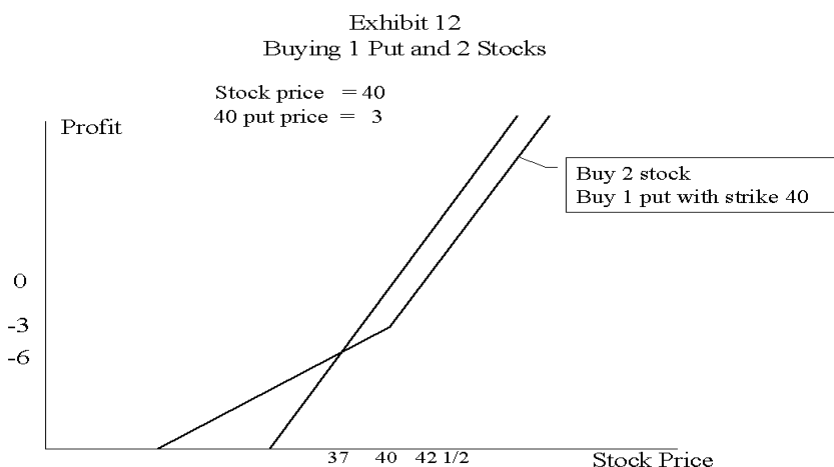
Vertical Spreads

A *vertical spread* involves the simultaneous purchase and sale of options identical in all aspects except for the strike price. These spreads are often called *price spreads*.

Vertical bullish call spreads involve the sale of the option with the higher exercise price and the purchase of the option with the lower exercise price. The solid line in Exhibit 13 illustrates the profit diagram of a bullish call spread that is obtained by purchasing the April 35 call and simultaneously selling the April 45 call option.

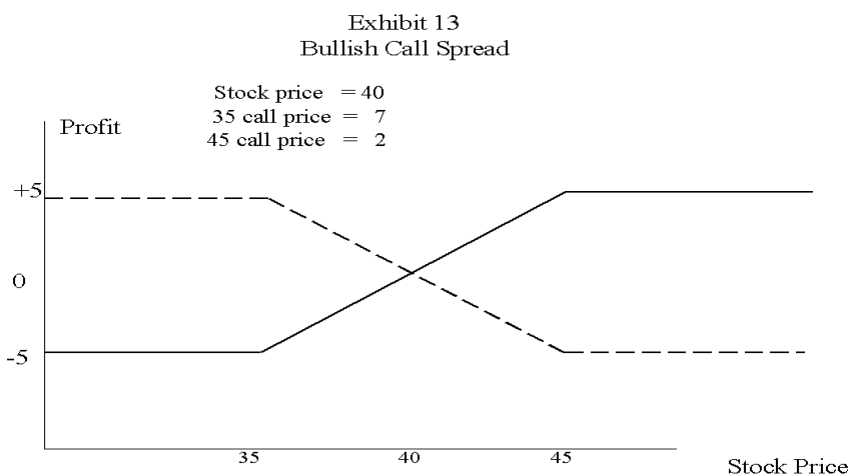
Bull call spreads tend to be profitable if the underlying stock moves up in price. The spread has limited profit potential and limited risk. In general, since the in-the-money contract is purchased and an out-of-the-money contract sold, the initial investment for the position is positive. For example, the initial investment for the bullish call spread in Exhibit 13 is \$5. The position always has a maximum profit if, at expiration, the stock price equals or exceeds the out-of-the-money strike price.

The maximum profit potential is obtained by computing the difference between the strike prices and subtracting the cost of the position (see Exercise 11). In the example, the difference in strike prices is \$10, the cost of the position is \$5, and the maximum profit is \$5. To compute the breakeven point for this spread, the investor simply adds the net cost of the spread to the lower strike price (see Exercise 12). In Exhibit 13, the breakeven point is \$40.



The strike prices selected for a bullish call spread depend on the investor’s beliefs concerning the stock price. A very bullish investor will select a very deep out-of-the-money option, while a more conservative (less bullish) strategy is to select adjacent contracts. Of course, an extremely bullish investor may not be interested in selling any deep out-of-the-money contract. That is, such an investor may prefer to hold a naked call.

A bearish call spread involves the purchase of the higher strike option and the simultaneous sale of the lower strike. For example, a bearish call spread could be established by buying the 45s and selling the 35s. Its payouts are indicated in Exhibit 13 by the dashed line.



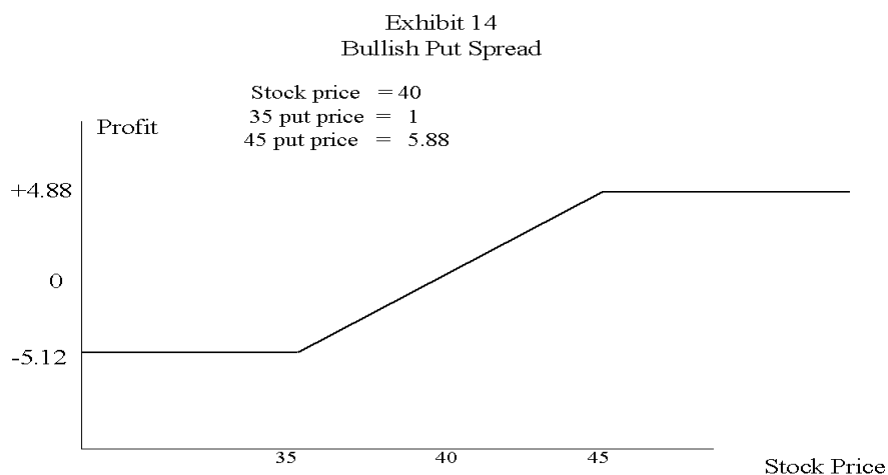
Bullish vertical put spreads are constructed by selling puts with high strikes and buying puts with low strikes. Exhibit 14 illustrates the profit diagram of a bullish put spread that is obtained by purchasing the April 35 puts and selling the April 45 puts.

Horizontal Spreads

A *horizontal (or time or calendar) spread* involves the simultaneous purchase and sale of options identical in all aspects except time to expiration. The principle behind a calendar spread is that, over time, the time premium of the near-term option will decay faster than the time premium of the long-term contract. While the initial price difference between two options with the same strike but different expiration dates may be modest, at expiration the price disparity should have grown, assuming little change in the price of the under-lying stock.

For example, consider the time spread set up by buying the July 40 call options for \$12.12 and selling the April 40 for \$10.88. The net cost of the position is \$1.34. If the stock price remains unchanged, at the April expiration date the April call will be worth its intrinsic value of \$10, while the July call will be worth more. If the July 40 call is worth more than \$11.34, the net profit will be positive if it is sold. In order to obtain a profit

function at the April expiration date, however, one would have to be able to value the July 30 contract in April. In later chapters we shall investigate how to plot the profit functions of options positions when some (or all) of the options still carry a time premium.



Diagonal Spreads

Exhibit 15 presents the prices of call options on the security. The stock price is \$40.

Exhibit 15: Call Option Prices

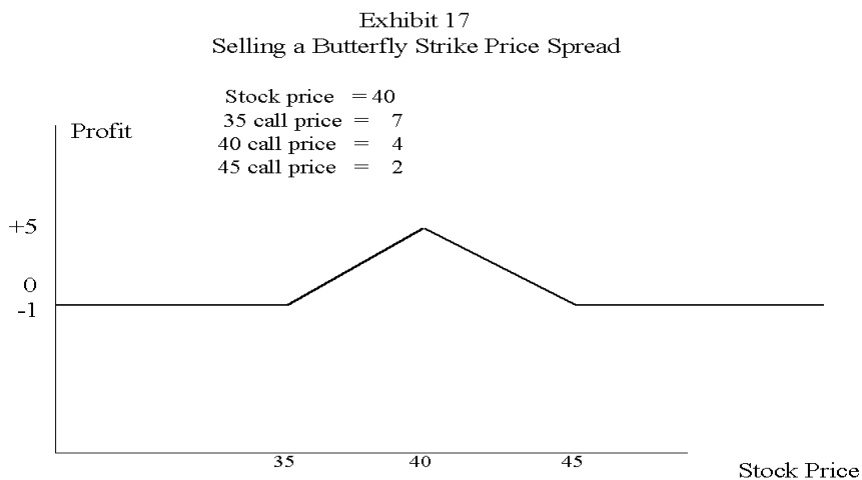
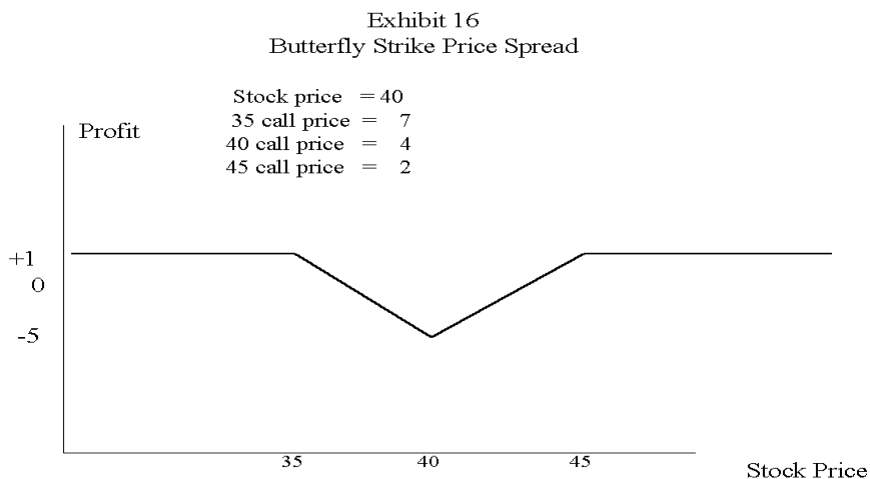
Strike	April	July	October
25	15.06	–	–
30	10.88	12.12	–
35	7.00	8.62	–
40	4	5.75	7.38
45	2	3.69	5.39
50	0.88	2.38	3.75

Vertical spreads get their name from the fact that options selected come from the same column. Horizontal spreads are so named because the options selected come from the same row. A diagonal spread involves the simultaneous purchase and sale of options that differ in both strike and time to maturity. For example, consider the purchase of a July 35 call option and the sale of an April 45 call contract. This position would constitute a diagonal spread.

Butterfly Strike Price Spreads

A butterfly strike spread is established when two middle strike options are purchased

(written) and two options one on either side are sold (bought). For example, consider a position consisting of buying two April 40 call options and selling the April 35 and April 45 contract. Exhibit 16 illustrates the profit diagram.



Note that the payouts take the shape of a butterfly, hence the name. The sale of the butterfly involves the sale of two April 40 together with the purchase of one April 45 and April 35 call option. The profit function is illustrated in Exhibit 17.

Like the 2:1 ratio write call strategy illustrated in Exhibit 9, the sale of the butterfly

spread produces maximum profits if the stock price remains unchanged. Note, however, that the maximum profit of the butterfly is \$4, compared to \$8 in the 2:1 ratio write strategy.

Moreover, the profit interval of the butterfly sale extends from \$36 to \$44, compared to \$32 to \$48 for the ratio write. To compensate for the reduced upside potential, however, the sale of the butterfly creates a limit of only \$1 on the downside. This is in contrast to the ratio write strategy, in which losses are unlimited.

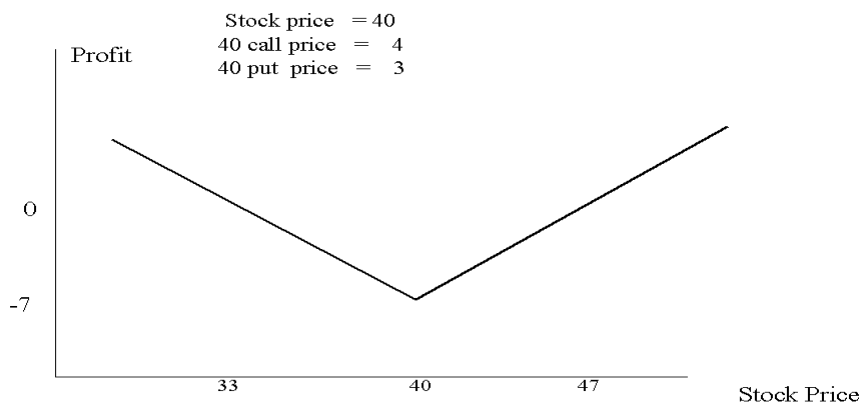
Butterfly Time Spreads

Butterfly time spreads can be established by purchasing (selling) two options in the middle series and selling (buying) a near and far series option. All options have the same strike.

Combinations

Combinations consist of the simultaneous purchase (or sale) of put and call options.

Exhibit 18
Payout of a Straddle



Straddles

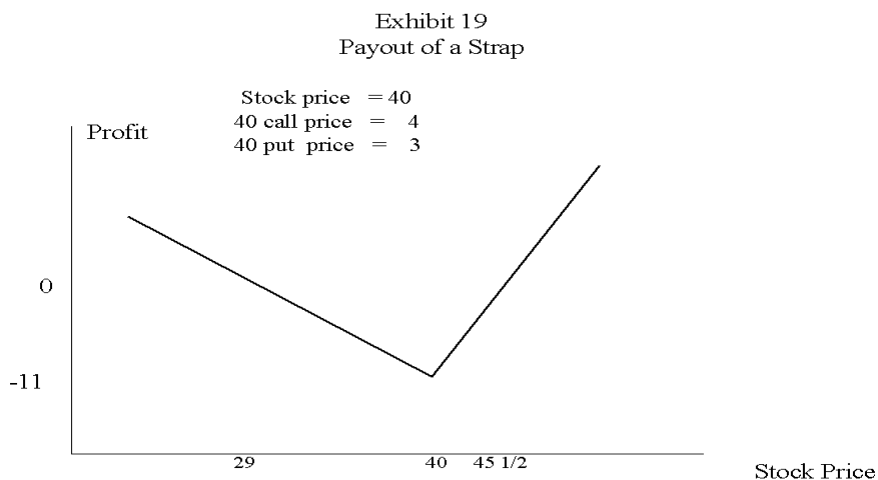
A *straddle* consists of the simultaneous purchase of a call option and a put option, with the same strike price and time to expiration. Exhibit 18 illustrates the profit diagram obtained from buying the April 40 call and the April 40 put. The breakeven points are 33 and 47.

Straddles are popular strategies to implement on securities that are highly volatile or are takeover candidates. Selling straddles involves more risk, since volatility can create large losses on both sides. To reduce the risk of large losses, a straddle seller may buy a put with a lower strike and a call with a higher strike. The resulting position looks similar to a butterfly spread.

Strips and Straps

A purchased *strip* consists of a long position in a call and put, together with an extra put. A *strap* consists of buying two calls and buying one put. Exhibit 19 illustrates the payouts of a strap consisting of buying two April 40 calls and one April 40 put.

Strangles



Consider the strategy of buying a call option with a strike price above the current stock price and a put option with a strike price below the current stock price: for example, buying the April 45 call options and the April 35 put options.

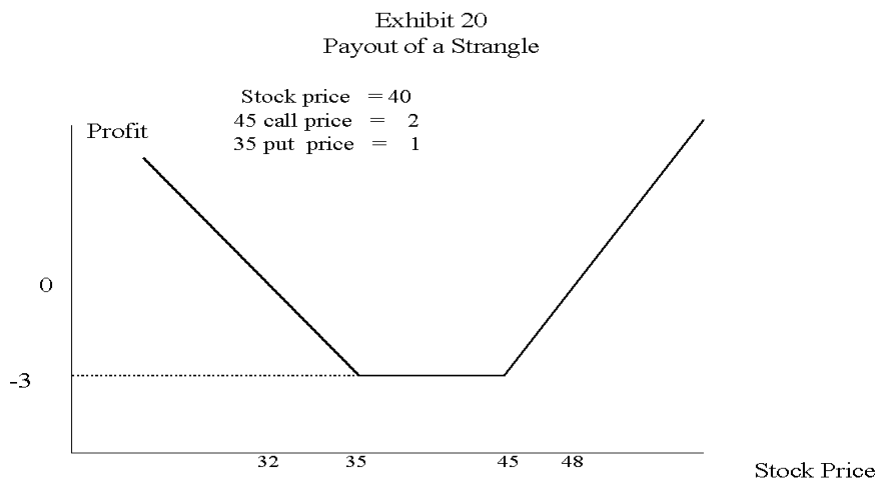


Exhibit 20 illustrates the payouts. This position is referred to as a *strangle*. A strangle is similar to a straddle in that profits can be obtained only if the stock price moves significantly

up or down. Note that the strangle profits if the stock price moves above \$48 or falls below \$32. In general, the stock price will have to move further than in a straddle for profits to be obtained. The strangle, however, has the advantage of having smaller maximum losses if the stock price does not move (compare Exhibit 19 with 17).

The Most Popular Stock Option Strategies

The number of ways options may be meshed around a particular stock is endless. However, there are some strategies that are very common.

Buy Call Options/Buy T-Bills

Rather than purchasing the stock, a less risky strategy may be to place a small fraction of funds in call options and the remainder in *T*-bills. If the stock does appreciate, the investor will benefit by selling the option. If the stock does not appreciate, the premium on the call is lost but the holdings in *T*-bills cushion this loss.

Cash Secured Put Writing

Consider an investor who believes the current stock price is quite favorable. Rather than buying the stock, the investor sells an at- or out-of-the-money put option and deposits the exercise price in escrow. If the stock appreciates in value, the put is not exercised and the investor profits by the full premium. If the stock falls in value and the put is exercised, the investor accepts receipt of the stock at a price that was originally perceived to be favorable. Since there is significant risk associated with cash-secured put writing strategies, they should be attempted only when possession of the stock for the strike price is considered desirable.

Protective Put Purchasing

For every 100 shares held long, the investor purchases a put option. The put effectively provides insurance against price declines below the strike price. The selection of the most appropriate put contract depends on the price protection that is sought and the premium of the option. High strike prices imply that a great degree of price protection is required and may be appropriate for highly risk-averse investors.

Covered Call Writing

At or out-of-the-money call options are written against stock owned. The objective is to earn additional income from securities that are not expected to significantly increase in value. However, if the stock does increase in value beyond the strike, losses from the sale of the call will be offset by the increased value of the underlying stock.

The Synthetic Short Sale

Rather than selling a stock short, an investor may consider buying a put and selling a call. The resultant position is referred to as a synthetic short sale because the profit function looks similar to the profit function associated with a short sale. The advantage of synthetic short sales over selling the stock short involves margin requirements and dividend

payments. Specifically, margin requirements for the synthetic short sale are smaller, and the investor is not responsible for dividend payments to the stock lender.

Conclusion

The profit diagrams provide an extremely useful tool for comparing the risks and rewards among hedging alternatives. Although margin requirements, commissions, and dividends have not been included in the analysis, such adjustments are possible. It should be recognized, however, that the profit diagrams do not tell a complete story. First, they assume positions are maintained unchanged over time. Second, the profit diagram ignores the likelihood of early exercise. As an example, consider the sale of a straddle. If the underlying stock increases above the call strike and then decreases below the put strike, large losses can result. When the stock price increases, the in-the-money call may be exercised, in which case the straddle writer must deliver expensive stock for the strike. Then if the stock price decreases below the strike price of the put, the "cheap" stock may be put on the straddle writer for the higher strike price!

This chapter has provided an overview of the various option strategies and has highlighted the immense patterns of distinct payouts that the meshing of options provides. The availability of stock options enables investors to design positions that reflect their preferences and outlooks for the underlying security.

References

The Options Clearing Corporation and the option exchanges publish many booklets that discuss the risks and rewards of specific option strategies and provide numerous examples. One limitation of our discussion in this chapter is that the analysis is static. In reality, option positions can be adjusted periodically as new information filters into the market. McMillan's textbook provides some insight into some dynamic strategies.

Several stock and option market computer simulation/education games allow the investor to build and analyze stock option strategies and to adjust them periodically as price changes occur, as time to expiration nears, or as dividend dates approach. These games are especially useful for those investors who are genuinely interested in learning the real world constraints without having to invest real dollars.

Blue Chip Software. *Millionaire*. Chicago: Britannica Learning Corporation.

McMillan, L.G. *Options as a Strategic Investment*. New York: New York Institute of Finance, 1980.

Ritchken P., H. Salkin, and G. Getts. *Portfolio Management: A Computer Simulation for Stock and Options*. Reading, Mass.: Addison-Wesley, 1989.

Exercises

1. XYZ trades at \$50. The stock pays no dividends. The call prices are

Strike	July	October	January
45	7	9	11
50	4	6	8
55	1	3	5

(a) Mr. Vestor owns 100 shares of XYZ but wants to improve the yield on the stock by earning option premium income. Mr. Vestor, however, is anxious not to have XYZ called away from him and believes by September the prospects of the firm will improve. Of all options available, which strike price/maturity combination should he write?

(b) How far can the stock advance before the strategy loses money relative to not selling options?

(c) If Mr. Vestor sold the XYZ/October/50 option, over what price range (at the expiration date) will this strategy yield greater profits than holding onto the stock alone.

2. Ms. Vestor bought 100 shares of XYZ at \$40 a share. It currently trades at \$60. A July 60 call option trades at \$6. Discuss the consequences of selling this option.
3. Mr. Vestor owns 200 shares of XYZ, purchased at \$20 per share. Compare the strategy of writing one call at \$15 and one call at \$25 with that of writing two calls at \$20. The current option prices are as follows:

Strike	Call Price
15	8
20	5
25	3

4. XYZ stock is currently \$53 a share. Ms. Vestor is unwilling to pay this price. Given that a put option with strike price of \$50 trades at \$2 a share, construct a strategy whereby the stock could effectively be purchased for less than \$50. What is the disadvantage of this strategy?
5. Mr. Vestor owns 100 shares of XYZ, which were purchased when the stock was \$52. The stock currently trades at \$60 . A 60 put option trades for \$4.
- a. Under what conditions (if any) should Mr. Vestor buy the put?
- b. Construct the payoff function for Mr. Vestor’s net position at the expiration date if he bought the 60 put option.
6. XYZ trades at \$47 and the following options are available:

Strike	Call Price	Put Price
40	$7\frac{3}{4}$	$1\frac{1}{2}$
45	2	$1\frac{3}{4}$
50	$1\frac{1}{2}$	$7\frac{3}{4}$

- (a) Construct the payoff function for the XYZ \$45 straddle.
 - (b) Under what conditions would you buy the straddle? When would you sell the straddle?
 - (c). Consider the \$45 strike price straddle. Plot the profit function at expiration. Compare the straddle to the previous straddle and state the assumptions under which an investor might find one preferable to the other.
 - (d) Assume the \$45 straddle is bought. After two weeks, with the stock at \$49, the call price has increased by \$2. The investor believes the stock price will not increase further and so decides to sell the call. This strategy is referred to as "lifting a leg." Discuss the advantages and disadvantages of "lifting a leg."
7. XYZ trades at \$80. Under what conditions would it be desirable to sell the stock short? What alternative option strategy would yield a profit function similar to the "sell stock short" strategy?
 8. XYZ trades at \$65. A January 60 put sells for \$2 and a January 70 call for \$3. Ms. Vestor buys the 60 put and sells the 70 call. Plot the profit function and discuss the pros and cons of the strategy.
 9. Show that the breakeven point for a bullish call spread is obtained by adding the net cost of the spread to the lower strike price.
 10. "Covered call strategies are fantastic! First, you collect a lot of dollars, for simply agreeing to sell your just bought stock at a higher price than you paid. The agreement money is paid to you right away. Your second source of profit could be cash dividends, due to you as owner of the stock. The third source of income could be the increase in price of the shares from what you paid, to the agreed selling price." Discuss this sales tactic.