Wiley Trading Series

The Complete Book of Option Spreads and Combinations

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Strategies for Income Generation, Directional Moves, and Risk Reduction

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The Complete Book of Option Spreads and Combinations

Strategies for Income Generation, Directional Moves, and Risk Reduction

Scott Nations

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For my mother, who always made the time to answer a question from a curious kid.

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FOREWORD

In this book, *Options Spreads and Combinations,* Scott takes the subject of options and option spreads and shows investors how they can be easy to understand through interesting, real world examples. Just as he does every week on CNBC's *Options Action* and in his first book, *Options Math for Traders,* Scott takes what many have viewed as intimidating concepts and breaks down the barrier of entry for the self-directed investor. Scott has a wonderful ability to use his years of experience and vast knowledge of markets and rather than use industry jargon or high-level mathematics, he breaks things down to a level that is interesting and easy to grasp for all levels of investor—from the novice to the seasoned. This ability to relate to and write for people of all knowledge levels, without arrogance or condescension is impressive when you review his track record which includes being the brains behind the "Nations VolDex®" implied volatility index.

This book encourages you to dig deeper, through poignant examples and real-life situations that can help your decision-making process when you face similar situations. Most importantly, as Scott has done this for a living and has the "battle scars" to show for it, he helps you set realistic expectations. He is not here to give a fly-by-night or get-rich-quick scheme. He is helping you become educated in the theory and reality of options trading so you can put together a realistic game plan and give yourself the opportunity for options trading success.

A prominent and important part of this book is to address some of the most common mistakes that retail traders make. All too often, when folks are starting out in the world of options trading, they only buy or sell single options in directional trades. This can be a successful strategy for some people but over time it is probably not a strategy with which

the average person can have long-term success. This book encourages you to consider spreading your trades, which spreads out your risk and the cost of your trades. As you read along, you will quickly grasp that this type of trading allows you to use less capital and define your risk right up front on your trades. You will have the opportunity in this book to learn about every type of spread trade that is realistic and imaginable.

Chapter 1 addresses the differences in risk and return and the fundamental difference in options payoffs, which sets the pace for the rest of this book and the difference in thinking about options as compared to just buying or selling stock. As Scott emphasizes, the ability for one to manage risk and exposure to the market is much easier if you understand these spreads. This concept of risk differentiates this book from others and is one to keep in mind as you read. Scott gives insight in to how a professional looks at trading. That is, the first thing he looks at is how much risk or how much exposure do I have, then he looks at potential return. This concept is so important and helps to mitigate one of the primary mistakes that many newer options traders have. By defining risk right up front, which most spreads do, it keeps the investor away from a situation where they are in over their head or have risked too much capital, while at the same time setting out a worst-case scenario right up front. You can see this clearly illustrated in Chapter 3 on vertical spreads, no matter if you are buying or selling the spread, you should view the money you can lose and the potential return on the trade. This is not to be minimized and should be heeded in every example. Read this to better understand risk and, more importantly, understand how to define the appropriate risk for you, and it can help you on your road to success.

Scott also does a great job of addressing the size of your trades and keeping risk appropriate. This helps to address another mistake that traders of all levels make; that is, they trade more contracts on a trade than they are ready to. Spreads help to mitigate this situation, but equally as important is the reminder to do what is right for you and what you are ready for in any market situation. This is an important step in achieving success in a way that does not have you up all night worrying.

As someone that talks to retail traders on a regular basis, I find it so refreshing to see someone teaching in a sensible, risk-defined manner to help the average person have a greater chance of success in the market. I commend Scott's thoughtful work delivered in fun and logical lessons in this book. I consider him one of the best options teachers. One of the great benefits of this book is that it is not going to be read and put away; this book can serve as a reference guide for the rest of your trading career. As you step up in knowledge or want to take different types of risk, you can reread the chapters on different spreads as you change your strategies based on market conditions. These lessons are timeless. I hope you enjoy this book as much as I did as you get the chance to learn from a great teacher and a great friend.

—JJ Kinahan

PREFACE

The goal of option trading is to make money. The vital element of making money over the long run is to define risk when you can and reduce the cost of your trade when you should. An option spread (essentially buying one option and selling a similar option) or an option combination (usually using two options in tandem such as buying both a put and a call or using an option in tandem with something else such as ownership of the underlying stock) is usually the best way to define risk and/or reduce the cost of your trade. Not every option spread or combination limits your risk but most do and they do it sensibly, without paying a huge penalty that destroys the mathematical advantage your option strategy might generate. In fact, certain option spreads generate even more mathematical advantage than outright option positions can. The purpose of this book is to help you understand these strategies and apply them intelligently because, again, the goal is to make money. We can and should enjoy both learning about options and trading them effectively, but both are a lot more fun when we're making money.

No trader is right every time, but you should make money more often than you lose money and your profitable trades should make more than your losing trades lose. The easiest way to do all these things is to use option spreads and combinations and to do so in a disciplined manner. That discipline includes taking your loss when your option spread trade isn't working. You will probably have lost a lot less money than if you had traded the stock or an outright option (rather than an option spread or combination) but using a lower-cost, lower-risk spread or combination doesn't mean we can ignore first principles and not take our loss when we should. A spread or combination is also a great tool when doing the hardest thing to accomplish when trading—adding to a winner well.

As we've mentioned, some spreads and combinations have a built-in advantage. For example, we'll discuss one built-in advantage when we discuss risk reversals. Covered calls are another combination with a different built-in advantage—over time, the call option you sell will generate more in premium received than the option is ultimately worth. Some spreads and combinations have a built-in disadvantage. Collars are a great way to define risk if you own appreciated stock but you're swimming against the tide a bit. That's okay as long as you don't use collars constantly and understand why that is.

The Complete Book of Option Spreads and Combinations isn't intended for someone who's a complete newcomer to options. We discuss outright options, that is, options that aren't part of a spread or combination, but outright options are rarely the right strategy, particularly if you're a speculative seller of options, so we'll focus on spreads and combinations and while they're not necessarily complicated, if you're still stuck on the difference between a put option and a call option then read this book but reread the first couple of chapters before diving into the strategies which begin with Chapter 3.

The Spreads and Combinations

We'll take a detailed look at nearly every common option spread or combination and we'll look at some rare, quirky spreads that even a professional option trader may never actually execute. I've been a professional option trader for a long time including decades in the option pits of Chicago and I've traded some odd combinations, sometimes including as many as eight legs but I don't believe I've ever actually traded a "guts" spread. But each strategy has something to recommend it and many show symmetry or similarity to another strategy. Once you start to recognize these similarities you can start to construct the best, cheapest-to-execute strategy given your market point of view. Once you can recognize these symmetries, you're also on your way to really understanding options, which means you're able to create return profiles that aren't just about more or less return but rather are fundamentally superior to the risk/return profiles that are possible if you're just trading stock. These fundamentally different return profiles are the real power of option spreads and combinations.

CHAPTER 1

Not Just More or Less but Different

Options are about choice and the freedom to do something, exercise your option, or not do that something and let your option expire. An option is the right but not the obligation to do something; in our context, it's the right to buy or sell stock at a predetermined price before the option's expiration date. For this reason, options are obviously very different than ownership of the underlying stock. While it's true that if you own stock you always have the freedom, the "option," of selling your stock, that's a pretty drastic choice; there's no middle ground. It's the choice inherent in ownership of an option, or the premium collected in selling an option, and the ability to enjoy the shades of gray between owning the underlying stock and not owning the underlying stock that make options such a useful tool. The owner of the option gets to make this choice but pays money for the privilege. The seller of the option doesn't get to make the choice, he's at the mercy of the option owner but he is paid for being at the mercy of the option buyer and he's often paid very handsomely.

This choice also means that options, when combined with other options in spreads and combinations and when combined with stock, result in risk/reward payoffs that are very different than stock alone or options alone can generate. If standard asset allocation between stocks, bonds, commodities, precious metals, and so on is diversification, then it's diversification in two dimensions. Allocation using different asset classes and option spreads or combinations is diversification in three dimensions.

"As we see it, the principal function of options is to provide a significant expansion of the patterns of portfolio returns available to investors. Such expansions make investors better off . . ."

Myron Scholes and Robert Merton

If you buy a share of stock and the price goes up by $1, then you've made $1. If the price goes down by $1, then you've lost $1. Pretty straightforward but not very nuanced either. By using options, particularly in a spread or combination, it's possible to create a trade structure that will make money if the stock goes up; it's possible to create a trade structure that will make money if the stock goes down; it's possible to create a trade structure that will make money if the stock doesn't move. It's possible to create trade structures that lose money if the stock moves a little but make money if the stock moves a lot. It's not just about more or less, with options the pattern of returns are fundamentally different.

But merely adding alternative structures isn't what really matters. What matters is that one of those payoff scenarios is likely to coincide with your outlook for the price action, or lack of price action, in the underlying stock. It's this ability to make money if the stock does what you believe it's going to do, regardless of what that belief is, even if it's the belief that the stock isn't going to go anywhere, that make spreads and combinations so useful.

While every investor or student of finance has heard of options, we'll focus on listed options on stocks, indexes and exchange-traded funds (ETFs). We won't discuss options to buy the real estate next door, nor will we discuss employee stock options, the sort of options given to employees as part of their compensation or as an incentive and that allow the employee to buy stock at a discount. Rather, we'll focus on the options nearly every investor can and probably should be using—listed options.

The "Flavors": Calls and Puts

Listed stock options come in two "flavors"—the right to buy stock (a call option, often referred to simply as a *call*) and the right to sell stock (a put option, often referred to simply as a *put*). It's useful to remember the terms by thinking of the option to buy stock as the right to call it away from the existing owner. The right to sell stock is the right to put the stock back into the market.

The owner of a call option gets to choose, that is, he has the option, whether to exercise his right and buy the underlying stock at the exercise price before the option expires. The seller of the call option has to sell the stock at the exercise price if the owner of the option elects to exercise it. In that case, the seller of the call option is required to sell the stock at the exercise price regardless of how far above the exercise price the stock is currently trading. In exchange for being willing to do so,

he will collect an option premium in the form of cash when he sells the option. This cash is his to keep no matter what.

The owner of a put option gets to choose whether to exercise his right and sell the underlying stock at the exercise price before the option expires. The seller of the put option has to buy the stock at the exercise price if the owner of the put option elects to exercise it. In that case, the seller of the put option is required to buy the stock at the exercise price regardless of how far below the exercise price the stock is currently trading. In exchange for being willing to do so, he will collect an option premium in the form of cash when he sells the options. This cash is his to keep no matter what.

One note: no one keeps track of whom you actually bought your option from or whom you sold it to. Rather, all options that share the underlying stock, expiration date, strike price, and type (call or put) are identical, regardless of which exchange they were executed on or which brokerage executed them, so when it's time for you to exercise your call option, the Options Clearing Corporation, the clearinghouse for option trades, will more or less randomly pick someone who is short one of those options to satisfy the duty to you.

The Expiration Date

For exchange-listed options, there are a number of expiration dates, usually by calendar month, to satisfy the hedging and speculation needs of all sorts of market participants, but for standard options, the expiration is fixed within the expiration month. The last trading day for these standard options is the third Friday of the month, and while the options technically expire the next day, the Saturday following that third Friday, for all intents and purposes the last day that matters is that last trading day. You can trade these options right up until the closing bell on that Friday and make the all-important decision about whether to exercise your option and buy (in the case of owning a call option) or sell (in the case of owning a put option) the underlying stock. We'll discuss this decision to exercise your option in greater detail when we define moneyness.

There are a few nonstandard expiration date regimes, and they can be useful. Many underlying stocks now have options with weekly expirations trading. Instead of expiring on the third Friday of the month, these will expire on the next Friday, or there might be two or more weekly expirations listed, each expiring on subsequent Fridays. The goal is to allow traders to take advantage of market events and catalysts such as earnings announcements; market-moving government announcements, such as unemployment and jobs data; or major corporate events, like a new product announcement or a Food and Drug Administration decision for a pharmaceutical company and to isolate that event or catalyst.

Some stocks, ETFs, and indexes also have quarterly expirations. These options expire on the last day of the calendar quarter and are intended for institutions that are judged by quarterly results.

TABLE 1.1 MSFT Option Expirations

Expiration Month/Year	Last Trading Date	Option Expiration Date
May	May 17, 2013	May 18, 2013
May Weekly	May 23, 2013	May 24, 2013
June	June 21, 2013	May 22, 2013
July	July 19, 2013	July 20, 2013
August	August 16, 2013	August 17, 2013
October	October 18, 2013	October 19, 2013
January '14	January 17, 2014	January 18, 2014
January '15	January 16, 2015	January 17, 2015

As an example, Table 1.1 shows expiration dates for options that were recently trading on Microsoft Corporation (MSFT).

This sort of range of expiration dates is about normal for a major stock like Microsoft. While some other stocks will have slightly different expiration cycles, most will have options expiring in the current month, if the third Friday hasn't passed, or the next month and the following month. After those first couple of expirations, the expiration months will usually fall into a more or less quarterly pattern. For example, options on McDonald's Corporation (MCD) follow a September/December cycle rather than the August/October cycle that MSFT did. For longer-term options, most stocks will have listed options expiring next January and one or two Januarys after that. Note that the last trading day is the third Friday of each month, while the option expiration is the next day, a Saturday. You can trade each option until the close of trading on that Friday, but in reality you'll have to make your decision about exercising any options you're long within a few hours of that market close. Your broker will have specific guidelines on when you must enter any instructions to exercise the options you own, but note that nearly every option you own that is in-the-money at the close of trading on that Friday will be automatically exercised. We'll define in-the-money in the moneyness section of this chapter.

There's not a lot of rhyme or reason to the expiration cycles, so don't get too involved in trying to figure out what expirations exist or why they're set up the way they are. There will be plenty of expiration alternatives for you to use.

The Strike Price

If an option allows the option owner to buy a stock at a predetermined price (in the case of a call option) or sell a stock at a predetermined price (in the case of a put option), what is that predetermined price? That is the price the option owner would

pay or receive if they chose to exercise their option. Hence, it's called the *exercise strike.* Some call it the strike price. The two terms are interchangeable, but we'll use the term *strike price.*

While the increments between strike prices used to be consistent and logical, it's a little more ad hoc now. For stocks below $50 with actively traded options, the increment between strike prices is usually $1. If the stock and options are less actively traded, meaning there's less demand for narrower strike price increments, then the increment is usually $2.50. The increment will increase as the stock price increases. With stock prices above $100, the strike price increment is usually $5, after all, with IBM trading above $200, a $5 strike price increment is only 2.5 percent of the stock price, while with MSFT just over $30, a $1 strike price increment is just over 3 percent of the stock price.

For these IBM options, we'd say they are "struck" every $5, and that's about as wide as the increment will get. Even with Google close to $1,200 a share, the options are still struck at $5 increments.

Remember that strike price increments are subject to market demand. If option exchanges hear from their customers that they'd like to see narrower strike price increments in XYZ stock, then the options exchanges are likely to offer narrower strike price increments for XYZ. Expanding bandwidth for exchange data feeds has made it easier for option exchanges to offer more strike prices, so they do, even if it ends up being a little confusing to the new option trader. Don't look for hard-and-fast rules for what strike prices will be listed; they're subject to this market demand for strike prices. In addition, as a stock moves around, it will near the top or bottom of the band of listed strike prices. It may seem that traders are "running out of" strike prices. Soon, the exchanges will list new strike prices for trading, but until that happens the strikes and their increments will seem odd. Don't be confused. The listed strike prices will almost certainly satisfy any trading or hedging need you might have.

An Option Corresponds to 100 Shares of Stock

Each regular option gives the right to buy, in the case of a call option, 100 shares of the underlying stock or to sell, in the case of a put option, 100 shares of stock—each option corresponds to 100 shares of stock. If you've sold one put option and the owner of the put option chooses to exercise it, then you're going to have to buy 100 shares of stock at the exercise price.

Just as stock is priced per share, regardless of how many shares you intend to buy, options are priced per share even though each option corresponds to 100 shares. If the option you buy is trading at 1.25, then your total outlay, assuming you buy a single option is $125.00 (1.25 × 100 shares).

Defining an Option

So we know what the underlying stock or ETF for our option is. We see the expiration and know that for regular options the third Friday of the month is the last trading day. For other options, like weekly or quarterly options, the expiration date is given explicitly. The strike price is understood. The type of option is easy—call or put. We know that each option corresponds to 100 shares of stock. With those pieces of information, we can precisely define any option so that every market participant, even a new option trader, understands exactly what the terms of the option are and how much any outlay will be for buying it and how much will be collected for selling it.

If we were to discuss the SPY June 150 put, then everyone would be in agreement about which option we're referencing. The underlying ETF is ticker symbol SPY, the S&P 500 ETF. The expiration date is the third Friday in June. If the third Friday in June for the current year has already passed, then we're discussing an option that will expire on the third Friday of June of the next year. If the third Friday hasn't already passed, then we're talking about an option that will expire the third Friday of June of this year. The exercise price or strike price (the two terms are synonymous) is 150. The buyer of this put gets the right but not the obligation; they get the freedom to sell 100 shares of SPY at $150 a share at or before expiration. If the quoted price of this option is 1.35, then the total outlay will be $135.00, ignoring commissions.

Let's jump in and look at some options listed on GM. We see these in Figure 1.1.

That June 37 strike call that is highlighted? We know that if we buy that call option, we assume the right but not the obligation to buy 100 shares at GM at 37.00. We have until the end of the day on the third Friday in June to exercise our option. The current market price of the option is close to 1.36, so we'll pay close to that for this option. The option market may demand a little more from us if we want to buy this option than they'll give us if we want to sell this option. The market may "ask" 1.37 of us if we want to buy this option, while the market may "bid" 1.35 if we want to sell this option. We'll discuss this "bid/ask" spread and how it can impact your option trading and the

	March Expiration		June Expiration		September Expiration	
Strike Price	Call	Put	Call	Put	Call	Put
30	5.23	0.11	5.53	0.61	5.85	1.15
31	4.28	0.18	4.75	0.82	5.10	1.48
32	3.38	0.29	3.95	1.10	4.43	1.84
33	2.51	0.48	3.30	1.46	3.83	2.25
34	1.83	0.79	2.67	1.89	3.25	2.72
35	1.22	1.23	2.18	2.39	2.77	3.20
36	0.76	1.81	1.74	2.96	2.34	3.80
37	0.46	2.52	1.36	3.60	1.95	4.43
38	0.25	3.35	1.05	4.30	1.62	5.10
39	0.14	4.25	0.81	5.10	1.34	5.83
40	0.08	5.18	0.60	5.95	1.10	6.60

FIGURE 1.1 Some Options in GM

TABLE 1.2 Profit or Loss for the GM Call Option We Bought

GM Stock Price at Expiration	Profit or Loss
33.00	–1.36
34.00	–1.36
35.00	–1.36
36.00	–1.36
37.00	–1.36
38.00	–0.36
39.00	0.64
40.00	1.64
41.00	2.64

decisions you make throughout this book. For simplicity's sake we'll generally assume each option has a single price that is between the bid price and ask price. If we indeed pay 1.36 for one of these GM call options then our total outlay is $136.00.

And if we sold that 37 strike call option at 1.36? We would collect $136.00, which would be ours to keep no matter what. If the owner of the call option chose to exercise it at any time before it expired, we'd have to deliver 100 shares of GM stock. We would be paid 37.00 per share for the stock we delivered no matter where GM is trading at the time. If we don't already own 100 shares of GM stock, then we would have to go into the market, buy 100 shares at whatever price it is currently offered at, and deliver those 100 shares.

The important concept here is that all the specifics of the option and the potential outcome are explained if we know the underlying stock, the strike price, whether the option is a put or a call, and the expiration date.

Buying that call option on GM, in fact, buying any call is a defined risk, unlimited potential profit position that profits if the underlying stock rallies enough. Let's look at how buying this 37 strike call option in GM would fare for a variety of prices of GM stock at the call option's expiration. We see this in Table 1.2.

Notice that no matter how low GM stock drops in price, the most our trade can lose is the 1.36 we paid for our call option, while the potential profit is theoretically unlimited since GM stock could theoretically rally infinitely. Let's look at a chart of these outcomes in the sort of payoff chart that we'll look at for other trades. You can see this payoff in Figure 1.2.

What if we were to sell that 37 strike call option at 1.36? Selling a call option is a defined potential profit but unlimited potential loss strategy that collects and keeps the premium but would require the call option seller to deliver 100 shares of the underlying stock at the strike price, 37.00 in this case, regardless of where the underlying stock was trading at the time. Let's look at how selling this 37 strike call option in GM would fare for a variety of prices of GM stock at the call option's expiration. We see this in Table 1.3.

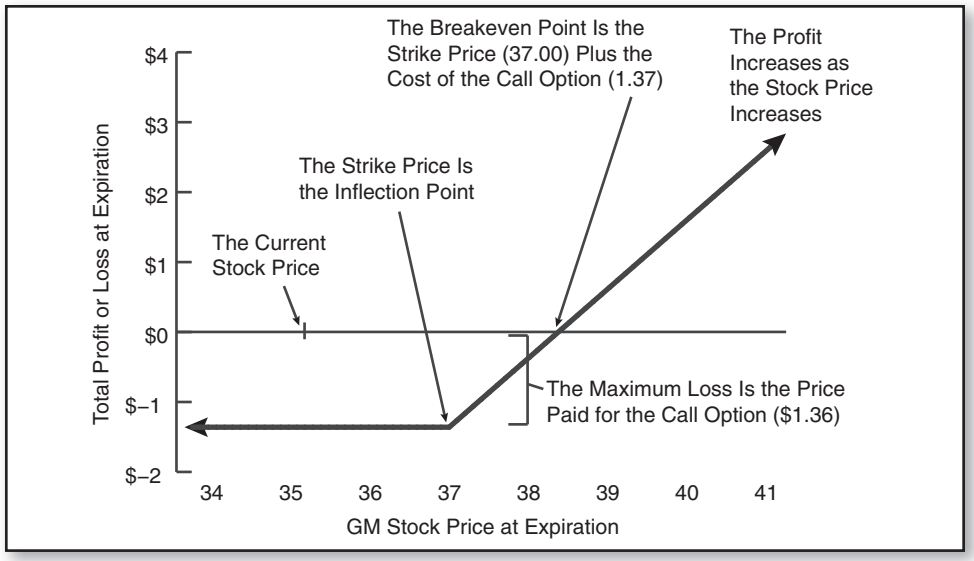


FIGURE 1.2 Profit or Loss for Our Long 37 Strike Call In GM

Selling this call results in a profit of 1.36 if GM is at or below 37.00 at expiration but losses money if GM rallies far enough. In this case that breakeven point is 38.36 (the strike price of 37 plus the premium received of 1.36). Let's see how this payoff chart would look. You can see that in Figure 1.3.

Notice that the maximum potential profit is the 1.36 in premium received, and we'll keep that as long as GM is at or below 37.00 at June expiration. Above 37.00, our profit starts to erode until we reach breakeven at 38.36. Above there, we lose money having sold this call, and the amount of our loss keeps increasing as long as GM stock keeps rallying.

TABLE 1.3 Profit or Loss for the GM Call Option We Sold

GM Stock Price at Expiration	Profit or Loss
33.00	1.36
34.00	1.36
35.00	1.36
36.00	1.36
37.00	1.36
38.00	0.36
39.00	–0.64
40.00	–1.64
41.00	–2.64

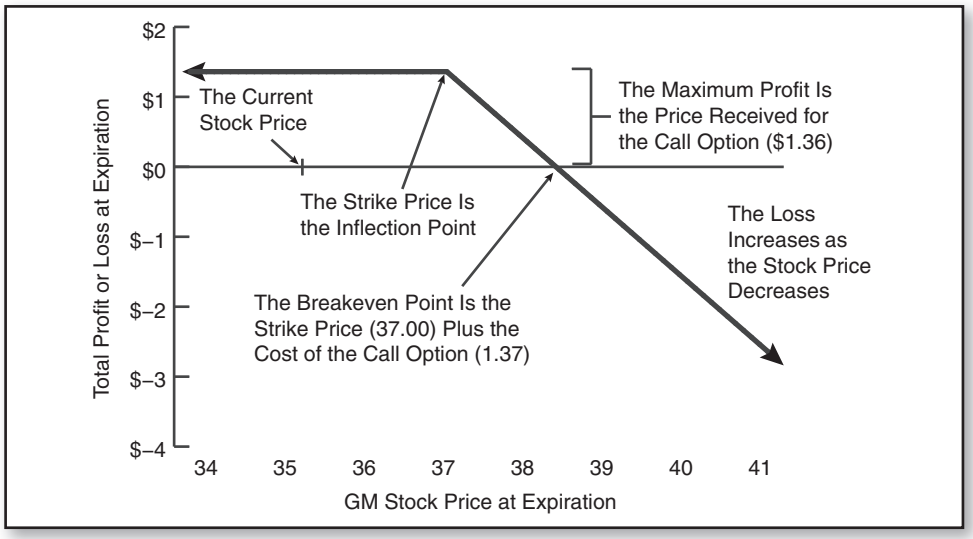


FIGURE 1.3 Profit or Loss for Our Short 37 Strike Call in GM

What about those put options we saw in Figure 1.1? What if we were to purchase that September 33 put that is highlighted? We would pay about 2.25 for that put option. Buying a put option is a defined risk way to profit from a drop in the price of the underlying stock. Our potential profit is limited only because the price of GM stock can't drop below zero. Let's look at a payoff chart for buying this September 33 strike put at 2.25. You'll see that in Figure 1.4.

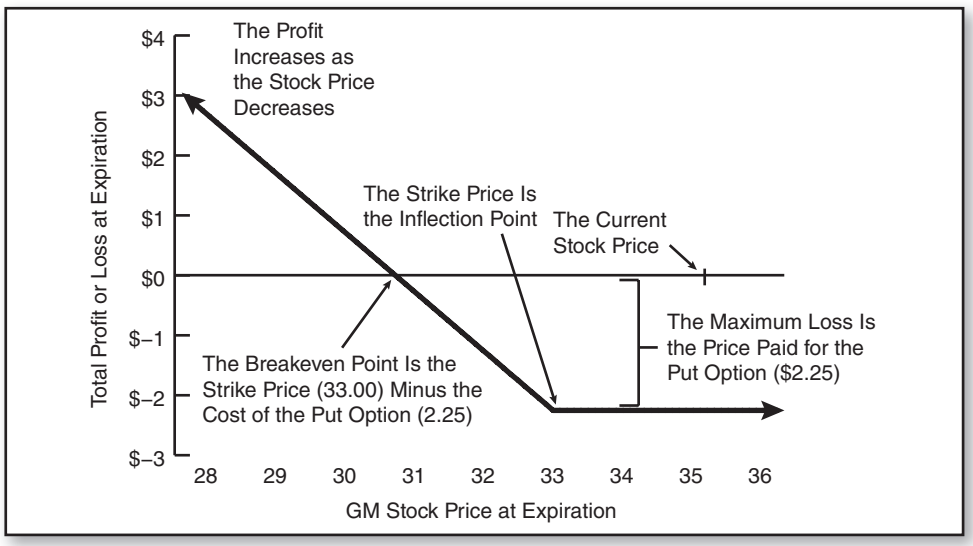


FIGURE 1.4 Profit or Loss for Our Long 33 Strike Put in GM

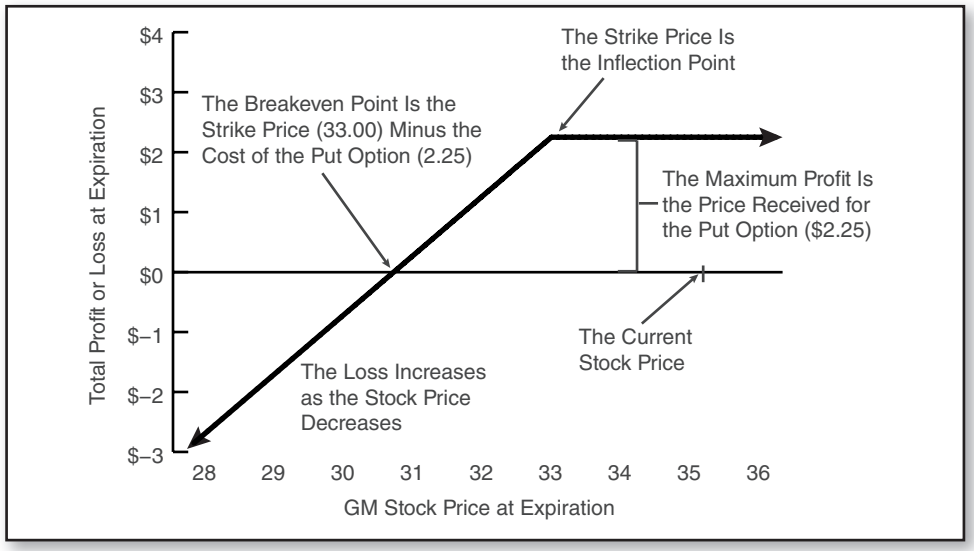


FIGURE 1.5 Profit or Loss for Our Short 33 Strike Put in GM

And if we were to sell that 33 strike put in GM at 2.25? We'd collect and keep the 2.25 but we'd be required to buy GM stock at 33.00 if the put owner chose to exercise his option, which he would do if GM were below 33.00 at that September expiration. We'd have to buy those shares regardless of how low GM stock was trading at the time. This means that selling a put, like selling a call, is a defined potential profit trade with huge potential losses. The only difference between selling a put and selling a call is that the stock is limited in how far it can fall only because it can't fall below zero. Let's look at the payoff chart for selling a put. We see that in Figure 1.5.

You'll notice that selling a call option is not the same as buying a put option. Similarly, selling a put option is not the same as buying a call option. The long call option needs the underlying stock price to increase. The short call option needs the underlying stock price to stay where it is, increase slightly while staying below the strike price, or fall. The long put option needs the underlying price to fall. The short put option needs the underlying price to stay where it is, decrease slightly while staying above the strike price, or rise.

Moneyness

If you're buying a put option to protect a long position in a stock that's currently trading at $100 a share, then you might very well buy a put option with a strike price of $100. You'd be protecting your position against any loss, although you'd be

paying for the option that would do so. You might very well buy a put option with a strike price of $95. You'd be willing to accept a small loss, $5 per share in this case, and the put option that provides that protection would cost quite a bit less than the 100 strike put, so you might think this is a reasonable risk and accept a small loss in exchange for a smaller outlay to buy the cheaper put. You probably wouldn't be willing to buy a put with a strike price of $105, that is, a put option that would give you the right to sell your stock at $105 per share. That's not really insurance and that 105 strike put option would likely be pretty expensive.

Each of these hypothetical put options are identical except for the strike prices and what really matters is not the absolute strike price but rather the relationship of the strike price to the current price of the underlying stock. The first put, the 100 strike put, had a strike price that was equal to the current stock price. This put would be pure protection—if the underlying stock drops at all, then this put buyer would be protected but would also enjoy any and all appreciation in the stock price. Such an option, either a put or call option, that has a strike price that is equal to the current stock price is said to be at-the-money.

The 95 strike put would have to have the market move before it would have any value at expiration. If the underlying stock weren't below $95.00 at expiration, then this option would be worthless and the buyer of the option would let it expire worthless. Since this is a put, the underlying stock has to drop. This option is said to be out-of-the-money because a move in the price of the underlying stock is required for the option to have any value at expiration. In this case, the option is a put option so the underlying stock must drop. If the option were a call option and the strike price were 105, then that call option would similarly be out-of-the-money because the underlying would have to move; in this case, it would have to rally in order for the 105 strike call to have any value at expiration. And that 105 strike put? That option is in-the-money, as would a 90 strike call option be. Table 1.4 explains moneyness; that is out-of-the-money, at-the-money, and in-the-money for all puts and calls.

Let's look at Figure 1.6 for specific examples of moneyness.

TABLE 1.4 **Option Moneyness: The Relationship between the Strike Price and the Price of the Underlying Asset**

	Call Options	Put Options
In-the-Money	The strike price is below the price of the underlying.	The strike price is above the price of the underlying.
At-the-Money	The strike price is equal to, or very near to, the price of the underlying.	The strike price is equal to, or very near to, the price of the underlying.
Out-of-the-Money	The strike price is above the price of the underlying.	The strike price is below the price of the underlying.

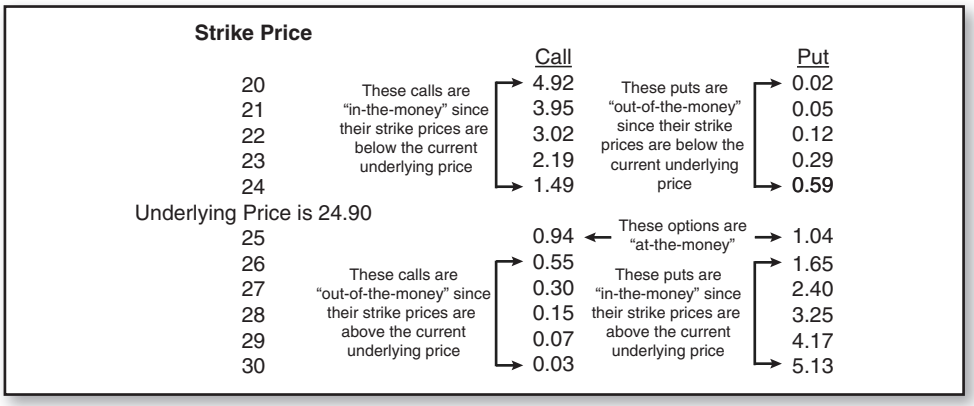


FIGURE 1.6 Moneyness Examples

What We Mean by Spread and Combination

We'll focus on option spreads and combinations rather than the outright option positions we examined earlier in this chapter. We'll focus on option spreads and combinations because they allow us to use options in tandem with an existing position in the underlying stock, resulting in a superior position that might provide protection or generate income in the form of option premium collected, or in tandem with other options to generate premium while limiting risk or using the math of option trading such as differential erosion of option values to our advantage or to make money if there's a big move in the underlying stock regardless of the direction of that move. Outright options have their place, but option spreads and combinations are so much more versatile, which raises the question: what do we mean by an option spread, and what do we mean by an option combination, and what's the difference between the two?

Generally, an option spread is constructed when we buy one option and sell a similar option. The similar option may differ only in the exercise price (a vertical spread) or in the expiration date (a calendar spread) or in both (a diagonal spread).

An option combination is generally constructed when we combine options with a position in the underlying stock such as owning the underlying stock and selling a call option against it (a covered call) or when we combine options in a way that doesn't really qualify as a spread. For example, if we thought there was going to be a big move in the underlying stock but didn't know the direction, we might buy an at-the-money call and an at-the-money put (since both options are likely to have the same strike price, this would be a straddle).

A Final Thought

The objective of option trading is to make money or to make the same amount of money with less risk. It's usually the case that using options in concert with each other or in concert with the underlying stock—that is, as a spread or combination—is the easiest way to do so. And it's also a great way to reduce risk in your trading. For example, selling a naked call option generates an infinite amount of risk since, theoretically, the price of the stock could increase infinitely. That's a pretty remote likelihood, but the point is that selling a call vertical spread defines the risk—it's now knowable. But reducing your risk in an option trade is good only if, over time, your trading makes money. Trading can be fun, but it's a whole lot more fun when it's profitable, so focus on the making money part and not necessarily on the trading part. That means don't trade just to trade. Trade when you have some insight. And use the best possible trade structure. That will often be a spread or combination.

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CHAPTER 2

Just a Little Math

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Understanding just a little of the math inherent in option trading will make you a vastly better trader. You'll understand that certain strategies are fundamentally superior to other strategies, but most importantly, you'll understand why that is the case. Once you understand the "why," you can start to weave this knowledge into your decision making, both when selecting an initial option strategy and when closing or spreading out of an existing trade.

In this chapter we'll focus on the price of an option versus the value of that option, how option prices erode over time and what this means for both option buyers and option sellers, and, finally, how changes in the inputs to an option price—inputs such as time to expiration, volatility, movement in the underlying stock, and a couple of others—will impact the price of an option. We'll also discuss the website that accompanies this book, www.OptionMath.com. We'll explain how to use the site and how the tools there can help you make better trading decisions.

The Option Price

The price of an option is determined solely by market demand and supply. Willing buyers and sellers come together, usually electronically, and trade at mutually agreeable prices. But don't think for a moment that this price is equal to the value of the option. While a number of sophisticated formulas exist to determine the value of an option, ultimately the value is unknowable until expiration. Option market participants all have their thoughts on what the value will ultimately be, and those estimates of future value are what drive the price that's seen today, but today's option price isn't necessarily today's option value. The current price for an option may turn out to be a fantastic bargain or insanely high, but it is the best estimate now of

the ultimate value. It's also important to remember that the ultimate value isn't how much the option is worth at expiration; rather, it's a measure of how volatile the underlying stock was during the term of the option. Why is this so? Because every option trader could, if they wanted to, hedge the directionality out of their option trade using the underlying stock. The result of this hedging is that the trade becomes purely a volatility trade. The value of this volatility trade is different than the value of the option at expiration. What's important to take away is that options have value even if they ultimately expire worthless. Option pricing models or formulas use this volatility over the term of the option rather than the price of the option at expiration to determine value.

These sophisticated formulas are intended to be used today, with the knowable inputs such as strike price, expiration date, current underlying stock price, interest rate, and so on, along with the single unknowable input, how volatile the underlying stock will be from today until the option expires at some point in the future, to estimate the value of the option. Note that we're trying to determine the value of the option, which may be very different than the current price of the option. The best-known formula is the Black-Scholes option pricing formula. It opened the door to logical option pricing based on a fixed number of parameters rather than simple guessing or even learned intuition. It's not important to memorize the Black-Scholes equation, it's not even necessary to look at it, so we won't, particularly because Black-Scholes is really intended for a very small universe of options (options that can be exercised only at expiration rather than the much more common option that can be exercised at any time and options on stocks that pay zero dividends) and makes a number of assumptions that simply aren't valid in the real world (for a discussion of these assumptions and the option market's response to the fact that the assumptions aren't valid, refer to Part Two of *Options Math For Traders*). But Black-Scholes is the gold standard, so that's what we'll use and it's the model that's available at www.OptionMath.com. And while most options can be exercised at any time, the price difference between options that can be exercised only at expiration and options that can be exercised at any time is usually very small. All option pricing formulas, including some other formulas that get more sophisticated to account for some of these issues, use essentially the same inputs. What are these inputs?

Inputs to an option's value include:

- The price of the underlying stock or exchange-traded fund (ETF).
- The type of option; is it a call option giving us the right to buy the underlying stock, or a put option giving us the right to sell the underlying stock.
- The strike price of the option.
- The expiration date, although we're really interested in the amount of time from today until that expiration date.

- The current risk-free interest rate.
- Any dividends to be paid during the term of the option.
- The volatility of the underlying stock during the term of the option.

You'll notice that all of these inputs, except for one, are given or are observable. For example, the strike price is a given as is the time to expiration and the option type (call or put). The price of the underlying stock and the current risk-free interest rate are observable. Dividends to be paid during the term of the option are also knowable, given the existing dividends declared or the current dividend policy, to a very high degree of certitude, particularly for options with a relatively short time to expiration. The only input that isn't knowable or observable is the volatility of the underlying stock during the term of the option. That's because the input is the volatility of the underlying stock from now until the option expires. Knowing that today would require the ability to peer into the future. We could look backward at the historical volatility of the stock but that may or may not be meaningful. If a big catalyst such as earnings release is imminent, then the stock is likely to be very volatile over the next couple of days, which would be important if our option were expiring next week. In this situation, the average volatility of the stock over the past 20 years isn't going to be very helpful.

Since all the inputs with the exception of volatility are knowable, you might think that volatility is the most confounding and important of the inputs. You'd be correct in both cases. If you could be absolutely certain of how volatile the underlying stock was going to be for the term of the option, you would be able to calculate the value—not just the price but the value—of the option today. You could then compare that value to the price that's available in the market and buy the option if it were priced below its value or sell it if it were above its value.

Volatility and the Volatility Implied by the Option Price

Since we know or can observe the values for all the inputs with the exception of volatility, and since we can observe the price of the option as it trades, it's possible to use an option pricing formula to work backward and calculate the volatility for the underlying stock that is assumed by the market and is thus implied by the observed option price. This *implied volatility* is the apples-to-apples measure of how expensive the option is, since it accounts for time to expiration, stock price, strike price, and every other input to an option pricing formula. As such, option traders consider implied volatility to be the real cost of the option rather than the dollar amount. We'll continue to use implied volatility as the measure of an option's price because you might think that an option priced at $3.00 is more expensive than an option priced

at $1.00 until you find out that the $3.00 option is due to expire in 12 months while the $1.00 option is due to expire next week.

Volatility is expressed in terms of the annualized standard deviation of returns of the underlying stock, meaning that an implied volatility of 20 percent means that the standard deviation of annualized returns is expected to be 20 percent for the life of the option. The market expects the annualized return for the relevant stock to be within a range of ± one standard deviation about 68 percent of the time, meaning that we'd expect this stock to have an annualized return that's greater than −20 percent and less than +20 percent 68 percent of the time. Notice that we're discussing annualized return, not annual return. We can take the return for any time period less than one year and annualize it to tell us what the annual return would be if every time period in the year experienced that return. Thus, if we're discussing a time period of one day or one week or one month, we're comparing apples to apples because we've annualized the return.

Option Erosion

The price and the value of options erode over time. This obviously makes sense; you wouldn't expect an option to maintain all of its value for months and months, then finally become worthless only on expiration. This erosion is a large part of the third dimension of diversification we mentioned in Chapter 1. This erosion is what makes options so fundamentally different from a simple position in the underlying stock or ETF. This option erosion can also be used to our advantage, such as when selling an option, selling a vertical spread, or buying a calendar spread. This erosion is the price that we pay each day we own an option, so it's the headwind that our long option position must overcome. The result of erosion is that we can be right on the direction the underlying stock is going in and still lose money if it doesn't accomplish the move to a big enough degree or quickly enough. Some readers will realize that a big move or a quick move in the underlying stock means that the stock has been volatile.

But how does erosion actually take place? What can we expect in terms of option erosion over time? If we use the option calculator at www.OptionMath.com, we can create a hypothetical call option, leaving all the inputs unchanged but changing the time to expiration and seeing how the value of the hypothetical call option will erode:

Price of the underlying stock:	$100.00
Strike price of the call option:	100
The risk-free interest rate:	1 percent
Dividends to be paid during the term of the option:	0.00
Estimated volatility of the underlying stock during the term of the option:	20 percent

What we'd expect this option to be worth based on time to expiration:

100 days to expiration:	4.31
50 days to expiration:	3.02
25 days to expiration:	2.12
5 days to expiration:	0.94

Obviously, the erosion of this option isn't linear. Let's connect the dots by plotting a chart of the value of the option for each day from 100 days to expiration to the day of expiration. You can see that graph in Figure 2.1.

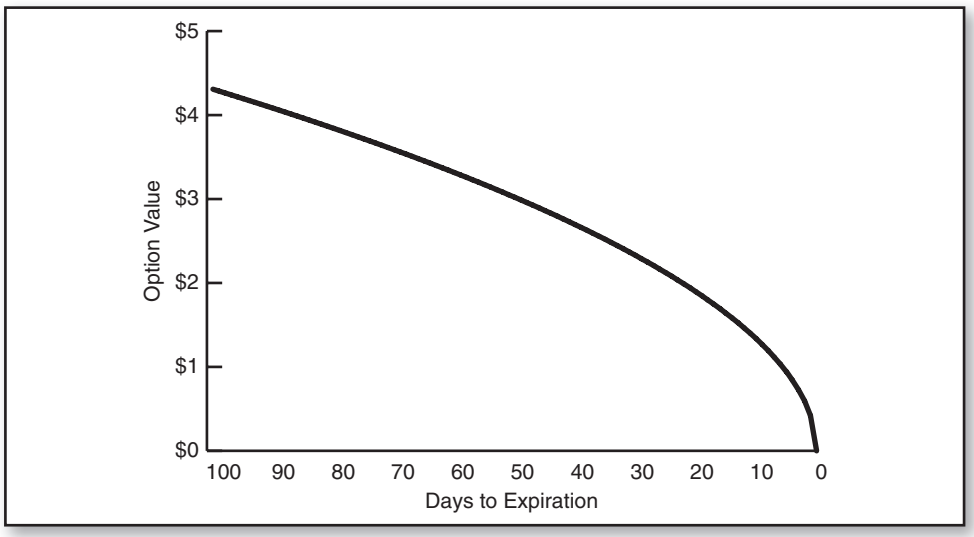


FIGURE 2.1 Option Value by Time to Expiration

Obviously, erosion speeds up as time to expiration nears. This means that the day-to-day ownership of a long-term option is relatively inexpensive, particularly when compared to the day-to-day cost of ownership of a very short-term option. The erosion we'd expect this option to experience on the day 100 days prior to expiration is about 0.03, while we'd expect it to experience erosion of 0.42 on the day of expiration.

Option Price Sensitivities

We've seen the factors that influence the value of an option, including how the passage of time changes the price of an option. If any one of those input values changes, the value of the option will change. It's easy to get bogged down in these sensitivities, so we won't delve too deeply, but it's important to have a familiarity with some of them. Let's look at the most important.

Sensitivity to the Passage of Time

We've already seen how the passage of time, from 100 days until expiration to the day of expiration, changed the price of our hypothetical 100 strike call option with the underlying stock at 100.00. This parabolic erosion as expiration nears is something we can take advantage of, and we talk about that, most specifically in Chapter 6, "Calendar Spreads."

Sensitivity to the passage of time is usually measured in terms of the expected erosion in price for a single day, again assuming that all the other inputs are unchanged. Since we're talking about how the option price is expected to change, and since the option price will decrease as time passes, again given that all the other inputs are unchanged, this measure is usually in the form of a negative number.

Option traders call this daily erosion *theta*. It's a handy measure to understand. The option price calculator at www.OptionMath.com will calculate the theoretical theta for your option or the options making up your spread or combination. Since we've seen how erosion increases with the passage of time, this theta value is valid only for today, but it's easy to calculate for any number of days to expiration.

We saw how the value of the option decreased as time passed, but let's look at a very similar chart, the amount of daily erosion expected for each of those days (Figure 2.2).

This erosion is for the 100 strike call with the underlying stock at 100.00. But how does this erosion work for that 100 strike price call with the stock at other prices? Figure 2.3 shows the erosion of that 100 strike price call option on the day that is

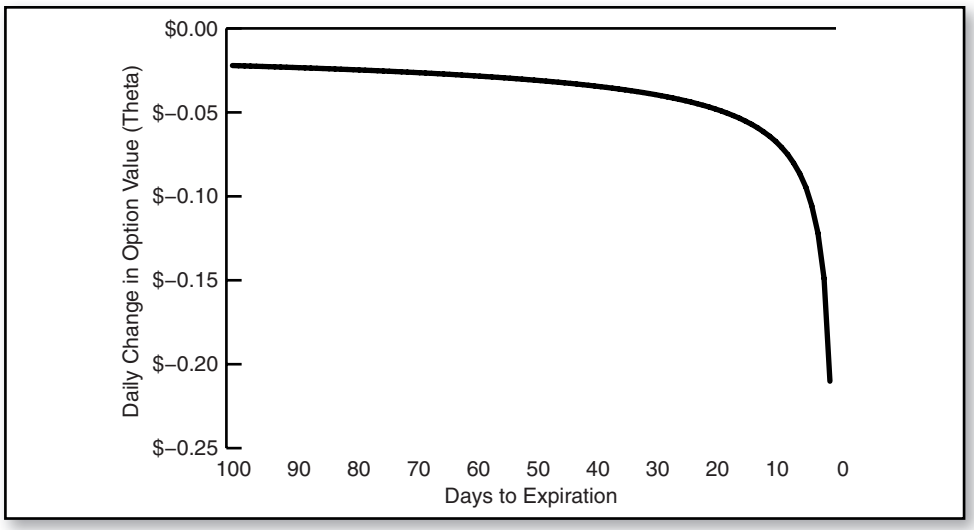


FIGURE 2.2 Option Erosion by Time to Expiration

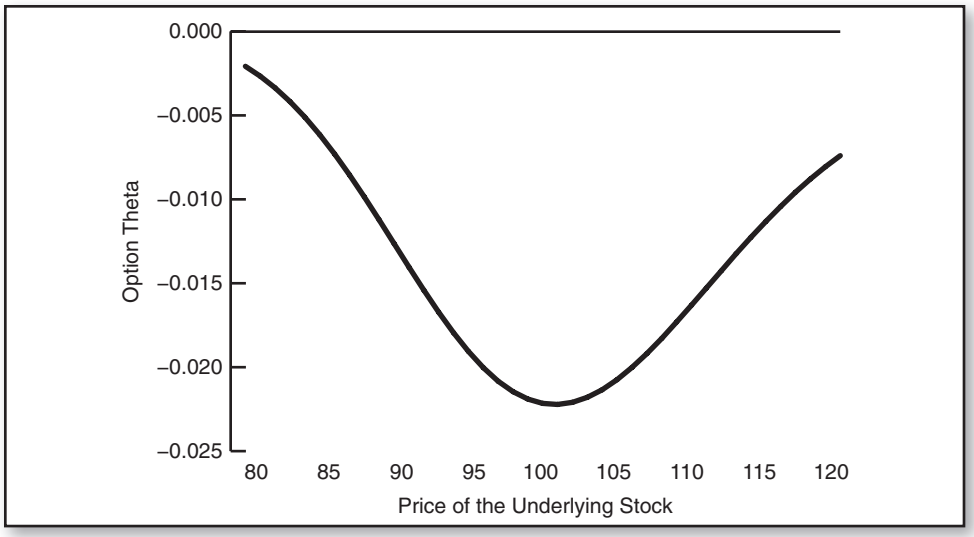


FIGURE 2.3 Option Erosion by Underlying Stock Price

100 days before expiration for a range of underlying prices for the stock. You'll notice that erosion is greatest for the 100 strike call when the stock is very close to 100.00. That's because that is when the option has the most time value. It's this time value that is eroding away. Theta decreases as an option gets farther from at-the-money because the amount of time value decreases. You might think that an option that is very expensive in absolute terms because it is in-the-money will experience a lot of erosion, but inherent value doesn't erode away, only time value erodes, and since a deep in-the-money option has so little time value, it will experience little erosion.

Sensitivity to the Price of the Underlying Stock

The price of the underlying stock was the first input we mentioned, and obviously the price of the stock will have a substantial impact on the price of our option. As the price of the underlying stock increases, the value of a call option should increase (everything else remaining unchanged, a useful assumption for this discussion but unlikely in the real world, where time will elapse even if nothing else changes), and as the price of the underlying stock decreases, the value of a call option should decrease (making the same assumption). Similarly, as the price of the underlying stock decreases, the value of a put option should increase, and as the price of the underlying stock increases, the value of a put option should decrease.

Let's use the spreadsheet at www.OptionMath.com to determine the value of our hypothetical 100 strike call option with 30 days to expiration and assuming a range of prices for the underlying stock.

What we'd expect this call option to be worth based on the price of the underlying stock:

Underlying stock at 80.00:	0.00
Underlying stock at 90.00:	0.07
Underlying stock at 100.00:	2.33
Underlying stock at 110.00:	10.20
Underlying stock at 120.00:	20.08

Let's connect the dots again and see what this option is worth for a large range of underling stock prices. You can see this in Figure 2.4.

As you can see, when the stock is well below the strike price of the call option, the option isn't worth much and the value of the call option changes very little for each $1 change in the price of the underlying. This change in the value of the call option for each $1 change in the price of the underlying stock increases as the price of the underlying stock increases until the underlying stock price is well above the strike price when each $1 change in the price of the underlying results in a $1 increase in the value of the call option. Why is this? When the underlying moved from 80.00 to 81.00, the odds of our 100 strike call option being in-the-money at expiration increased, but by just a tiny bit, so we'd expect the value of our call option to change by just a tiny bit. However, when the underlying stock moved from 99.00 to 100.00, the odds of our 100 strike call option being in-the-money at expiration became essentially 50/50; if the stock is at 100.00, then it's precisely at-the-money. If the

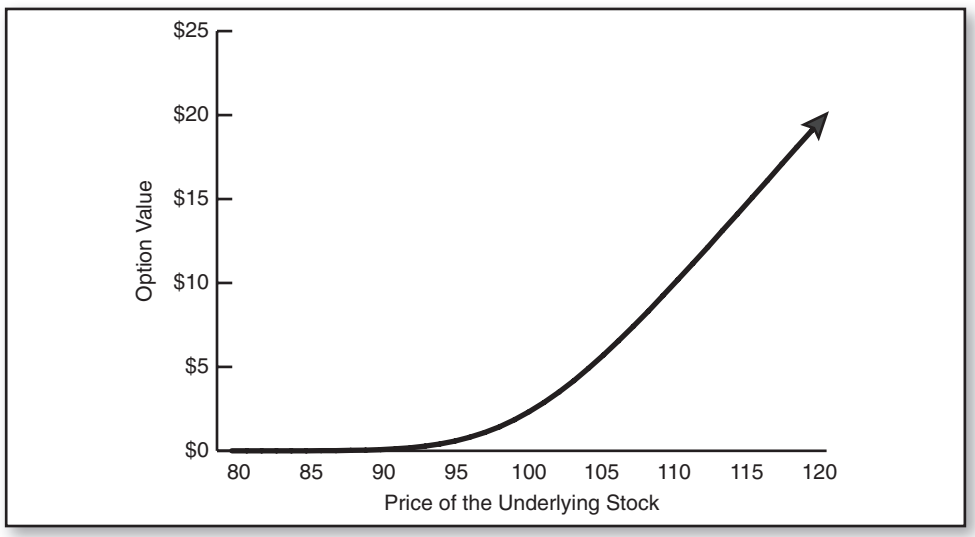


FIGURE 2.4 Sensitivity to the Price of the Underlying Stock

underlying drops by a single penny from 100.00 to 99.99, the call option is out-of-the-money and will expire worthless. If the underlying climbs by a single penny from 100.00 to 100.01, the call option is now in-the-money and will be exercised at expiration.

If the price of the underlying is well above our strike price, say it moves from 119.00 to 120.00, then the odds are nearly 100 percent that our call option will be in-the-money at expiration. But the odds were nearly 100 percent with the stock at 119.00. At 120.00 the odds are greater but only by a small amount because they were already close to 100 percent.

We've already mentioned how someone might trade the underlying stock against their option position in order to wring the directionality out of the combined position. How many shares should they trade? They should trade the number of shares that is equal to the odds of their option expiring in-the-money. Why? Because that is how much the price of the option should move for each $1 move in the price of the underlying stock. Our 100 strike call should change in price by a very small amount if the underlying stock rallies from 80.00 to 81.00 because there is a small chance of the option being in-the-money at expiration. Our 100 strike call should change in price by about 0.50 if it is at 100.00 and moves by 1.00 because the odds of the option being in-the-money at expiration are about 50 percent. And with the underlying stock at 119.00? The odds of the option being in-the-money at expiration are very close to 100 percent, so we'd expect the price of the option to move by about $1.00 for each $1.00 move in the price of the underlying.

For those trying to wring the directionality out of the trade and turn it into a volatility trade, this measure of the expected change in the price of the option given a $1.00 change in the price of the underlying is the hedge ratio they should use. For those using options for directionality, this measure is the likelihood that the option will be in-the-money at expiration.

Since this measure is the expected change in the price of the option, it's called *delta*. You can use it in both ways, as a measure of the expected change in the price of the option given a $1 move in the price of the underlying, as well as the likelihood that the option will be in-the-money at expiration. Both uses mean it's also the hedge ratio for someone who is trying to wring the directionality out of their position. Table 2.1 shows how to use the underlying stock to wring directionality out of an option trade. The resulting combination is purely a volatility trade.

Delta is calculated as a fraction so it can have a lower limit of 0.00 (the odds of anything happening can't be below zero) and an upper limit of 1.00 (the odds of anything happening can't be greater than 100 percent). The convention is to truncate the percent sign, meaning that a calculated delta of 0.50, a 50 percent chance of the option expiring in-the-money, is usually referred to as 50. This is done because this is

TABLE 2.1 Using the Underlying to Create a "Directionless" Trade

Option Position	Underlying Position
Long a call option	Short shares—the number of shares is equal to the option's delta or "hedge ratio"
Short a call option	Long shares—the number of shares is equal to the option's delta
Long a put option	Long shares—the number of shares is equal to the option's delta
Short a put option	Short shares—the number of shares is equal to the option's delta

the number of shares that should be executed to turn one option into a directionless volatility trade, since one option corresponds to 100 shares of stock. The worksheet at www.OptionMath.com will calculate the option delta for you. If we do that, we find the following deltas:

Delta of 30-day 100 strike call with the underlying stock at 80.00:	0
Delta of 30-day 100 strike call with the underlying stock at 100.00:	52
Delta of 30-day 100 strike call with the underlying stock at 120.00:	100

The odds of the 30-day 100 strike call being in-the-money at expiration if the underlying is at 80.00 now aren't actually zero. They're slightly higher than zero, as you'd expect. It's not impossible for the stock to rally from 80.00 to above 100.00 in those 30 days. It's just very unlikely—so unlikely that when we round the decimal, we get zero. If we expand our calculation to more decimal places, we find, using the calculator at www.OptionMath.com, that the odds are actually 0.006 percent, meaning the delta is 0.006, which rounds to zero. Similarly, the odds of the 100 strike call being in-the-money at expiration even if it's at 120.00 now, meaning the stock doesn't drop from 120.00 to below 100.00, are slightly less than 100 percent. It's actually 99.937 percent. We round our delta to 100.

Observant readers will be wondering why an option with a strike price precisely equal to the current price of the underlying stock won't have a delta of exactly 50. Remember that delta measures the likelihood that the option will be in-the-money at expiration and that expiration is still 30 days away. The Black-Scholes option pricing model assumes the underlying stock will appreciate by the risk-free rate of return (1 percent in our example) during those 30 days, meaning the model expects the underlying stock to be at about 100.08 at expiration—the 100 strike call would be in-the-money by 0.08; hence, the delta is greater than 50. There are other phenomena at work as well that result in a delta of more than 50, including issues like lognormal returns, but those are topics for more extensive study.

Figure 2.5 shows the delta for our hypothetical option for the same range of underlying prices.

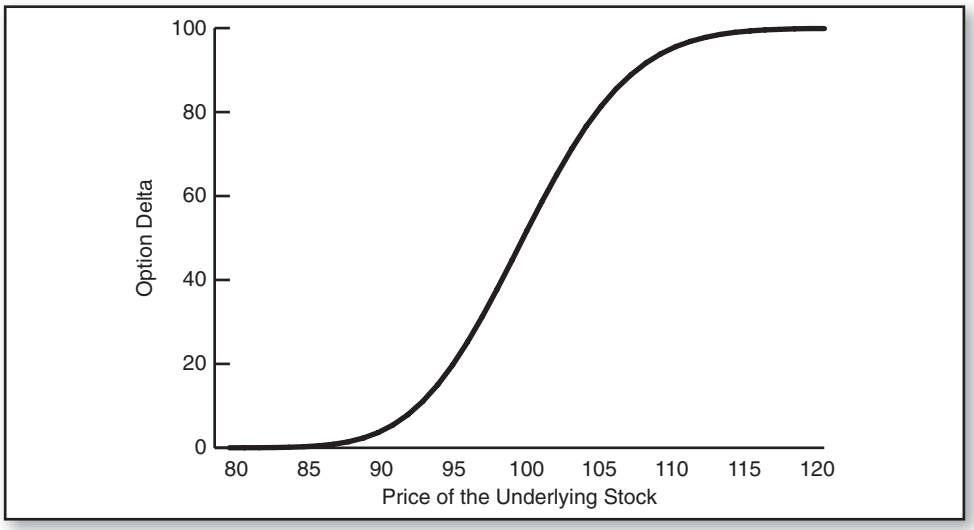


FIGURE 2.5 Delta by Stock Price

Changes in Volatility

We said earlier that volatility is the most confounding input in our effort to know the value of an option. Again, if we could peer into the future and know how volatile the underlying stock was going to be for the term of our option, then we would know just how valuable the option is. We also saw earlier that we could use an option pricing model and all the knowable or observable inputs, as well as the price the option is currently trading at, and reverse engineer the volatility the market expects for the underlying stock for the term of the option. This is the volatility implied by the observed option price. You can use the tools at www.OptionMath.com to calculate the implied volatility for the options you're looking at.

What happens to an option price if the volatility assumption changes? How much does the option price change given a change in the volatility input? Let's look at a slightly different hypothetical 110 strike call option with the underlying stock at 100.00 and 365 days to expiration for a range of volatility inputs and see what the option pricing model at www.OptionMath.com says the option is worth.

Annualized volatility of 5 percent:	0.94
Annualized volatility of 10 percent:	1.14
Annualized volatility of 20 percent:	4.61
Annualized volatility of 50 percent:	16.46
Annualized volatility of 100 percent:	35.68

Let's connect the dots again, this time in Figure 2.6, and see what the option price would be for the full range of volatility inputs.

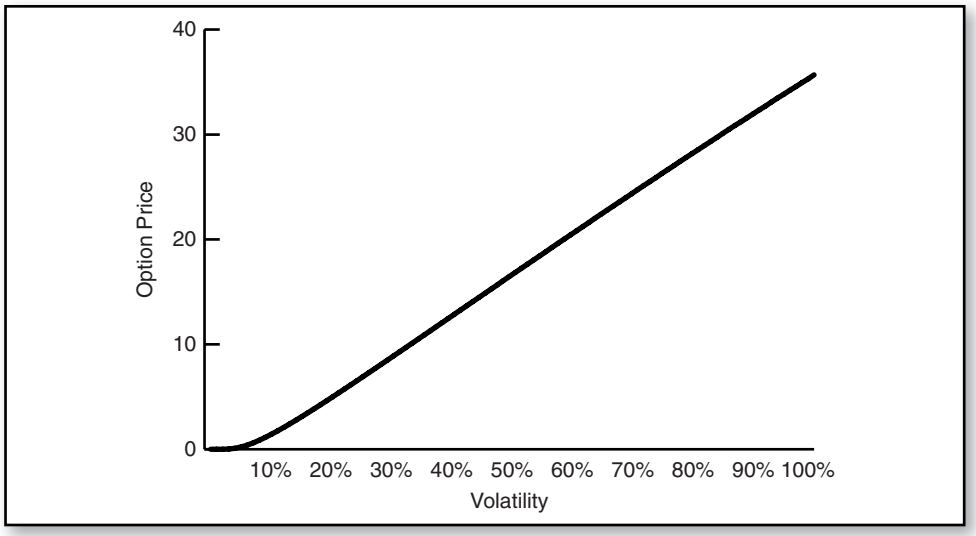


FIGURE 2.6 How Option Value Changes with Changes in Volatility Assumption

As you can see, when the volatility input rises above some very small and unlikely level, the relationship is essentially linear. The important takeaway here is that volatility is the input that matters the most in an option's price and that volatility is the best measure of the true cost of an option since it winnows out the variables such as strike price and time to expiration and the price of the underlying stock.

The change in option price that we'd expect to see given a 1 percent change (from, say, 20 percent to 21 percent) in volatility is called *vega*. Vega is usually quoted as a positive number, and that's the way we do it at www.OptionMath.com, so it is the increase in an option's price if the volatility input increases by 1 percent with all the other inputs unchanged. An increase in volatility will increase the price of both a put option and a call option; the option price will increase by vega. A decrease in volatility will decrease the price of both a put option and a call option; the option price will decrease by vega.

Other Sensitivities

As we saw, there are other inputs to option pricing models including the risk-free interest rate. Changes in the interest rate will generate changes in option prices. Owning a call option is, after all, something of a proxy for ownership of the shares, but it requires much less capital, so we'd expect interest rates to have some impact. However, the impact of interest rates on option prices is very small. It's too small for the average trader to be concerned about. For the professional, this sensitivity is called *rho,* and you can calculate rho for your option, option spread, or option combination at www.OptionMath.com, but when you do, you'll find that the impact is indeed very small.

One other sensitivity that some option traders consider has to do with the fact that the sensitivity of an option to changes in the price of the underlying stock, the delta we discussed earlier, changes as the price of the underlying changes. As we saw, the delta for our 100 strike call with 30 days to expiration was infinitesimal when the underlying stock was trading at 80.00, while the delta was 52 with the underlying stock at 100.00, and was 99.9 when the underlying stock was at 120.00. Clearly, the delta changes as the underlying price changes, and that makes sense as the likelihood that the option will be in-the-money at expiration is clearly related to its moneyness; that is, where the stock is currently trading in relation to the strike price.

The fact that the delta is the hedge ratio necessary to wring the directionality out of a volatility-based trade means that as the price of the underlying stock moves, the hedge ratio changes, necessitating adjustments to the amount of underlying stock that is hedging the option position. How much will the delta change if the underlying stock moves from 100.00 to 101.00 (or from 80.00 to 81.00 or from 119.00 to 120.00)? That is the amount of stock that will have to be executed in the adjustment trade to keep the correct hedge ratio; this is the amount by which the delta will change. The measure is called *gamma*. Traders using options for directional trades don't have much use for gamma since they're not worried about adjusting their position to remove directionality. Instead, they want the directionality. For directional traders, gamma can tell them how quickly the directionality of their trade will change. If gamma is high, then the directionality of the trade will increase or decrease quickly. If gamma is low, then the directionality of the trade will change slowly. You can calculate gamma at www.OptionMath.com.

Figure 2.7 shows the gamma for our 100 strike call with 30 days to expiration over a range of prices for the underlying stock. The gamma is greatest with the stock

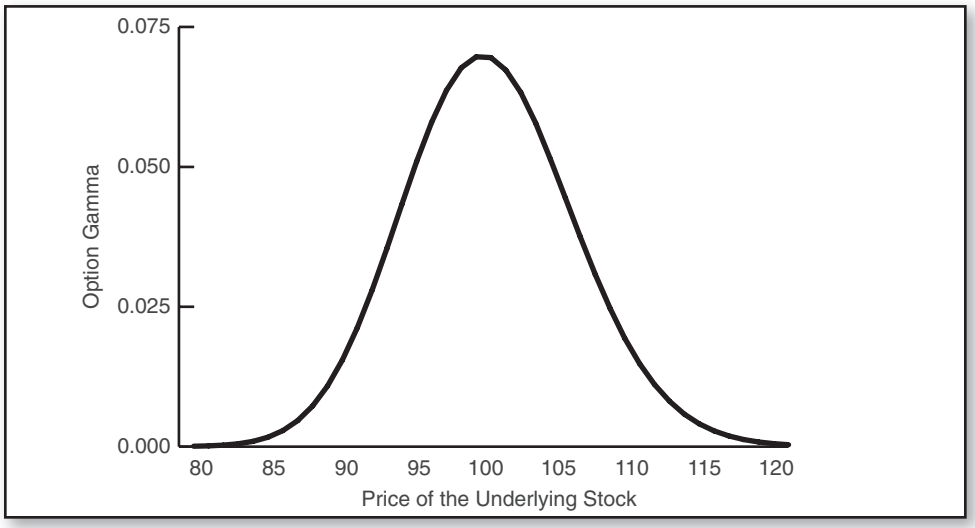


FIGURE 2.7 Gamma

at-the-money for the reasons we've already discussed. A move from 80.00 to 81.00 or a move from 119.00 to 120.00 won't change the likelihood of the option expiring in-the-money by very much. With the stock at 81.00, the likelihood is still pretty remote. With the stock at 120.00, it's very certain but only a tiny bit more certain than it was with the stock at 119.00.

Now you know what options are, the inputs to their value, and how changes in those inputs will impact the value of the option. The website www.OptionMath.com was constructed to help you do some of these calculations yourself. The calculation worksheet will calculate theoretical option values and sensitivities given your inputs as well as the volatility implied by the observed price for an option. Use the site, but keep checking back, as we'll post new educational content regularly.

Now let's look at those option spreads and combinations.

CHAPTER 3

Vertical Spreads

Vertical spreads are just about the simplest option spread imaginable. A vertical spread is constructed by buying one option and selling an option that is identical to the first option except for the strike price. It might be easier to think of a vertical spread as a "strike spread" since the strike is the only difference between the two options; the underlying asset, type (put or call), and expiration date are the same. To make certain the trade is a true spread, as opposed to a combination, we're long one option and short the other.

We begin with vertical spreads because they are, simply said, a necessary tool for option traders. Whether long or short a vertical spread, both risk and reward are defined, so selling vertical spreads (we'll define what we mean by selling a vertical spread later in this chapter) is a great way to get a payoff that is much like selling an outright option while defining risk. If you're inclined to sell options, and it's not a covered call or a cash-secured put, then selling a vertical spread is preferable because you have reduced your risk to a tiny fraction of what it would be if you were naked short an outright option.

Vertical spreads will also become important elements in other combinations when we replace an outright option with a vertical spread in order to improve a strategy. For example, if you wanted to sell a covered call but also wanted to participate to the upside if there's a really big move from, say, a takeover, then you'd replace the short call in your covered call with a short call vertical spread. We'll do the same sort of replacement of outright options in collars and risk reversals, but more about those structures later.

Vertical spreads likely got their name because strike prices run vertically in most option listings. Usually, the expirations run horizontally so calendar spreads are often called "horizontal spreads," but we'll stick with calling these two spreads vertical

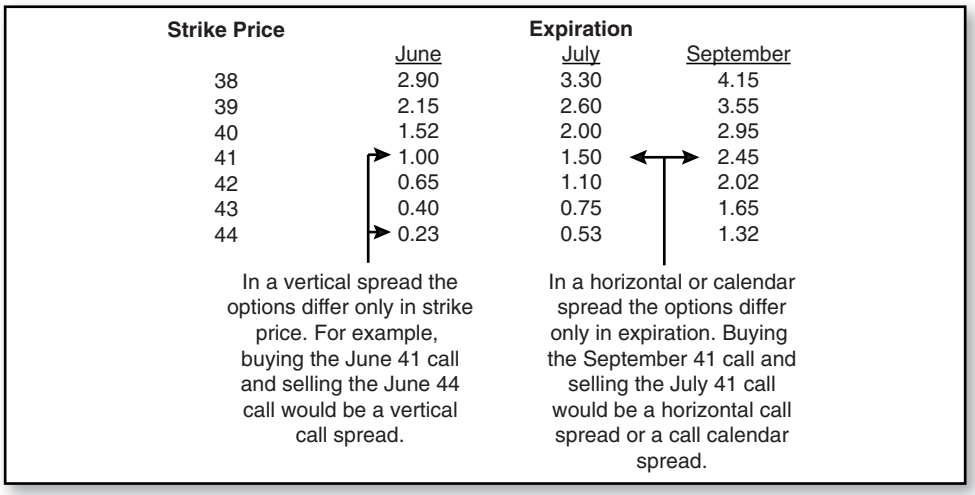


FIGURE 3.1 Some Call Options

spreads (or verticals) and calendar spreads (or calendars). Let's look at some call options and a call vertical spread you might execute. You'll see these in Figure 3.1.

For example, given the call option prices in Figure 3.1, if we bought the June 41 call at 1.00 and sold the June 44 call at 0.23, we would have executed the June 41/44 vertical call spread. We would have bought that call spread (we would be long) at a net price of 0.77 (1.00 – 0.23).

Buying and Selling Vertical Spreads

You buy a call spread when you buy the lower strike call and sell the higher strike call. You sell a call spread when you sell the lower strike call and buy the higher strike call. You buy a put spread when you buy the higher strike put and sell the lower strike put. You sell a put spread when you sell the higher strike put and buy the lower strike put. It may be easier to remember it like this: if you pay money for the spread, whether it's a call spread or put spread, you're buying the spread. And as you can see in Table 3.1, if you receive money for the spread, whether it's a call spread or a put spread, you're selling the spread.

TABLE 3.1 Buying and Selling Vertical Spreads

Buy a Call Spread	Sell a Call Spread	Buy a Put Spread	Sell a Put Spread
Buy the lower strike price	Sell the lower strike price	Buy the higher strike price	Sell the higher strike price
Sell the higher strike price	Buy the higher strike price	Sell the lower strike price	Buy the lower strike price
Pay for the spread	Be paid for the spread	Pay for the spread	Be paid for the spread

Vertical Spread Maximum and Minimum Values

Vertical spreads are a great tool because they limit risk, even when sold. As with an outright option, the minimum value for a vertical spread is zero. No matter how high or low the underlying stock goes, there's a floor under the value of a vertical spread, and that floor is zero. But unlike an outright option, there's an upward limit to the value of a vertical spread; there's a ceiling above which the value of a vertical spread cannot rise. That ceiling is the width of the spread or simply the upper strike price minus the lower strike price. For example, let's return to the June 41/44 call spread that we looked at previously. This spread is 3.00 wide, but let's see what that vertical call spread would be worth with the stock at some extreme prices at the June option expiration. You can see these in Table 3.2.

TABLE 3.2 Vertical Spread Maximum and Minimum Values

Stock Price at Option Expiration	Value of 41 Call at Expiration	Value of 44 Call at Expiration	Value of Spread at Expiration
0	0.00	0.00	0.00
41	0.00	0.00	0.00
44	3.00	0.00	3.00
100	59.00	56.00	3.00

Even if the stock dropped to 0.00 at expiration, the call spread could never be worth less than zero. No matter how high the stock goes, even if it more than doubles, even if it rallies infinitely, the maximum value of the call spread will be the width of the spread, which is the distance between the strikes.

This is a vitally important element of vertical spreads. It means we can use them in situations when selling outright options isn't appropriate, such as selling naked calls or naked puts.

Naming

Somewhere in the option nomenclature, someone decided to complicate vertical spreads by giving them confusing names like bull put spread and bear call spread, and so on. Professionals don't use that terminology, with good reason, and we won't either. In the preceding example, we bought the lower (41) strike call and sold the higher (44) strike call, and it cost us a net of 0.77 (1.00 – .023). We bought the call spread, as you saw in Table 3.1, and that's how we'll describe that trade: buying the call spread. We are now long that call spread. However, if we had sold the lower (41) strike call and bought the higher (44) strike call, then we would say we had sold the call spread, we would have gotten paid for selling it, and we would be short it. You can see this in Figure 3.2.

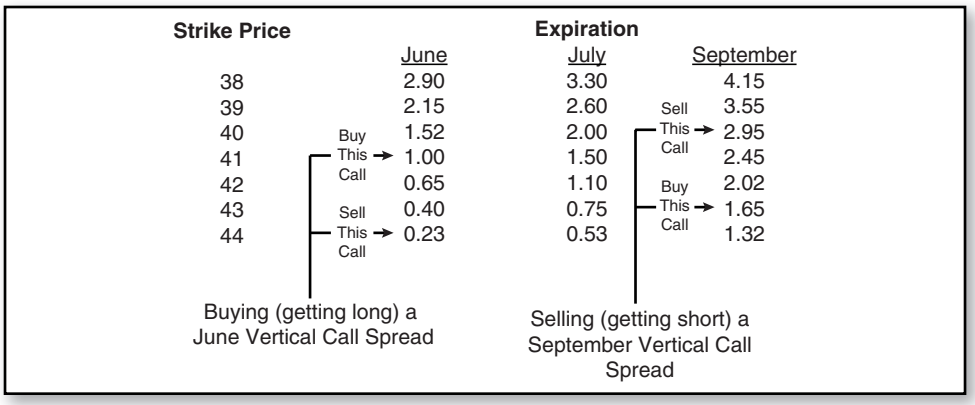


FIGURE 3.2 Call Options and Vertical Spread

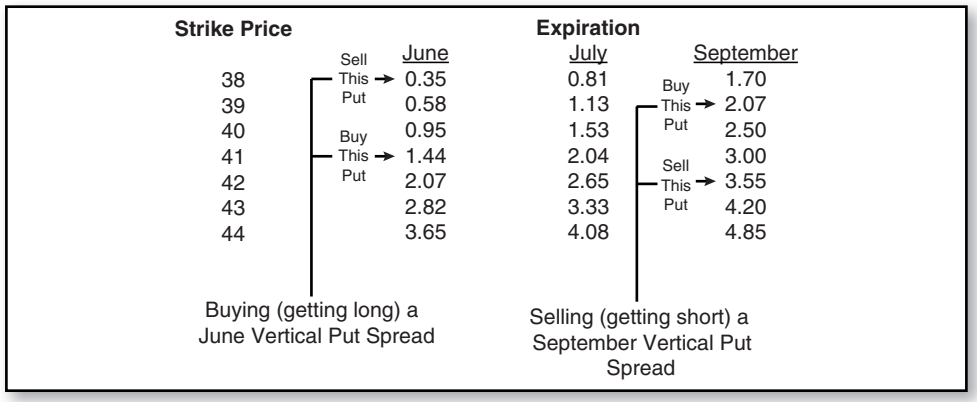


FIGURE 3.3 Put Options and Vertical Spreads

The same general idea applies to vertical put spreads: if you pay for the put spread, you're buying it; if you are paid money, then you're selling it. For example, using the put option prices in Figure 3.3, if we'd bought the June 41 put at 1.44 and sold the June 38 put at 0.35, we would have bought the put spread and would have paid 1.09 (1.44 – 0.35) for it. We bought the higher strike put and sold the lower strike put, so we bought the put spread.

If we had sold the July 42 put at 2.65 and bought the July 38 put at 0.81, we would have sold the put spread and received 1.84 (2.65 – 0.81) for it.

Moneyness and Vertical Spreads

We discussed moneyness of options in Chapter 1. To recap, if the strike price of a call is below the current market price of the stock, then the call option is in-the-money. If the strike price of a put is above the current market price of the stock, then the put option is in-the-money.

If the strike price of a call is above the current market price of the stock, then the call option is out-of-the-money. If the strike price of a put is below the current market price of the stock, then the put option is out-of-the-money.

If the strike price is equal to, or very nearly so, the current market price of the underlying stock, then the option is at-the-money.

Moneyness is really, really easy for a single option. What about for a vertical spread with two options? One option could be in-the-money, and another could be out-of-the-money. There are several combinations and permutations of moneyness for a vertical spread, but we'll primarily look at out-of-the-money vertical spreads (both legs are out-of-the-money when the trade is executed) and vertical spreads where one leg is at-the-money and the other leg is out-of-the-money, which behave just like fully out-of-the-money vertical spreads, since that's usually what we'll be using.

Vertical spreads where one leg is at-the-money and the other is in-the-money behave very much like fully in-the-money vertical spreads. Later in this chapter, we'll look at in-the-money verticals since they behave a little differently than out-of-the-money vertical spreads.

Bullish and Bearish Vertical Spreads

As with buying an outright call, buying an out-of-the-money (both legs of the spread are out-of-the-money or one leg is at-the-money and the other is out-of-the-money) call spread is bullish, we need the market to rally for the spread to be profitable. However, selling a call spread, at least one that's out-of-the-money, needs the underlying stock or asset to do anything as long as it doesn't rally sharply. This means a short call vertical isn't really bearish. It can do well if the stock goes down, sideways, and even if the stock goes up a little as long as it is below the strike price we are short when expiration arrives.

Buying an out-of-the-money put spread certainly needs the underlying stock to fall in order to make money. Selling an out-of-the-money put spread, needs the stock to do anything but fall sharply in order to be profitable. It can rally, it can move sideways, it can even fall a little bit.

The fact that selling a vertical spread means any number of things can happen and we can still make money is the primary reason we won't use the bullish/bearish terminology for vertical spreads.

Let's revisit the simple out-of-the-money call spread we first looked at in Figure 3.1. If we bought the June 41 call at 1.00 and sold the June 44 call at 0.23, we would be long the June 41/44 call spread at 0.77. The underlying stock was at 40.56 at the time we observed these option values, so both legs are out-of-the-money. As we've discussed, this is a bullish trade, and we would execute it only if we expected this stock to go up.

TABLE 3.3 Payoff Table for Buying a Call Vertical

Stock Price at Option Expiration	Value of 41 Call at Expiration	Profit or Loss on 41 Call at Expiration	Value of 44 Call at Expiration	Profit or Loss on 44 Call at Expiration	Total Profit or Loss
37	0.00	–1.00	0.00	0.23	–0.77
38	0.00	–1.00	0.00	0.23	–0.77
39	0.00	–1.00	0.00	0.23	–0.77
40	0.00	–1.00	0.00	0.23	–0.77
41	0.00	–1.00	0.00	0.23	–0.77
42	1.00	0.00	0.00	0.23	0.23
43	2.00	1.00	0.00	0.23	1.23
44	3.00	2.00	0.00	0.23	2.23
45	4.00	3.00	1.00	–0.77	2.23
46	5.00	4.00	2.00	–1.77	2.23
47	6.00	5.00	3.00	–2.77	2.23
48	7.00	6.00	4.00	–3.77	2.23

How would this trade perform across a range of prices for the underlying stock? Let's construct a profit-and-loss (P&L) table because this is often the easiest way to understand how the trade works, when it doesn't work, and what we need the underlying market to do. We won't construct a P&L table for every trade we discuss, but it's helpful to do it a few times to make certain we understand the concepts fully. The P&L information for buying this vertical call spread can be seen in Table 3.3.

As with any vertical spread (or outright option) that we buy, the maximum loss is the net price that we pay for the spread. In this case that's 0.77. The maximum profit is a little different. It's the maximum potential value of the spread, or 3.00 (44 – 41) in this case, minus the price we paid for the spread or 0.77 in this case. That means the maximum profit for this long call spread is 2.23 (3.00 – 0.77). Notice also that the total profit or loss starts to change when the underlying stock is right at the strike prices of the constituent options. The strike prices are inflection points for our payoff.

What would that spread look like graphically? We can see that in Figure 3.4.

This call vertical does best if the underlying stock rallies. In fact, it needs the underlying stock to rally from the current price of 40.56 to at least 41.77 if it's going to avoid losing any of the 0.77 paid for it. That means buying this out-of-the-money call vertical is bullish so, again, you'd buy it only if you expected the underlying stock to go up. In Figure 3.5 you can see how the underlying stock must rally for the spread to be profitable.

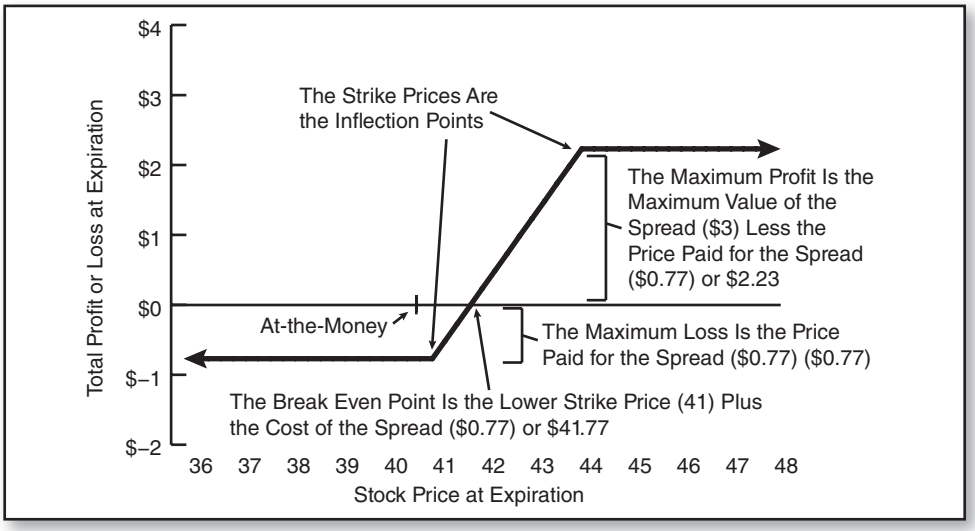


FIGURE 3.4 Payoff for Buying a Long Vertical Call Spread

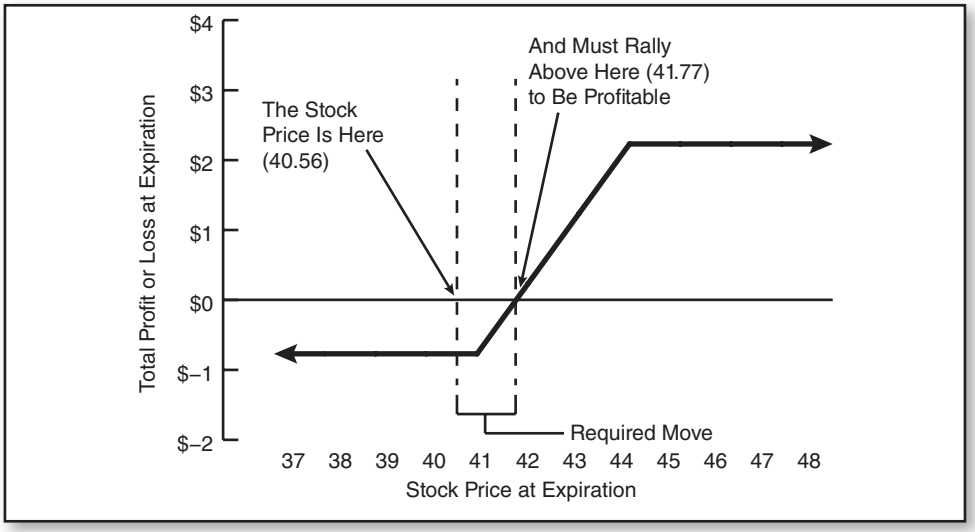


FIGURE 3.5 Stock Must Rally for Long Call Vertical Spread to Be Profitable

Selling a Call Vertical Spread

But what if we'd sold this call vertical? What if we'd sold that 41 call at 1.00 and bought the 44 call for 0.23, collecting a net of 0.77 (I'd never sell a naked call, so not only does buying that 44 call turn this into a vertical spread, it also defines the risk of selling the 41 call). That payoff table looks different as you can see in Table 3.4.

TABLE 3.4 Payoff Table for Selling a Call Vertical Spread

Stock Price at Option Expiration	Value of 41 Call at Expiration	Profit or Loss on 41 Call at Expiration	Value of 44 Call at Expiration	Profit or Loss on 44 Call at Expiration	Total Profit or Loss
37	0.00	1.00	0.00	–0.23	0.77
38	0.00	1.00	0.00	–0.23	0.77
39	0.00	1.00	0.00	–0.23	0.77
40	0.00	1.00	0.00	–0.23	0.77
41	0.00	1.00	0.00	–0.23	0.77
42	1.00	0.00	0.00	–0.23	–0.23
43	2.00	–1.00	0.00	–0.23	–1.23
44	3.00	–2.00	0.00	–0.23	–2.23
45	4.00	–3.00	1.00	0.77	–2.23
46	5.00	–4.00	2.00	1.77	–2.23
47	6.00	–5.00	3.00	2.77	–2.23
48	7.00	–6.00	4.00	3.77	–2.23

The graphical payoff chart for selling this 41/44 call vertical can be seen in Figure 3.6.

The risk/reward for selling a vertical spread is certainly different than the risk/reward for buying a vertical spread. In selling this call spread the maximum we can make is the 0.77 received. The maximum we can lose is the maximum value of the spread (3.00) minus the net premium received (0.77) or 2.23 (3.00 – 0.77). We'll discuss this asymmetry later in this chapter, but it's an important element of trading vertical spreads.

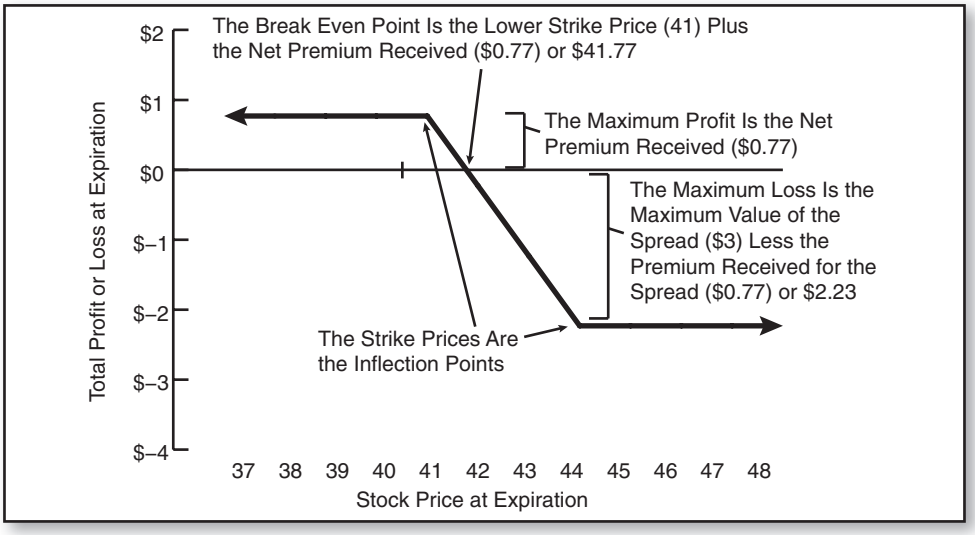


FIGURE 3.6 Payoff for Selling a Call Vertical

Breakeven Points

If we buy a vertical spread, then the market has to move in order for it to be profitable. How far does it have to move? If we sell a vertical spread, then the market can move and the spread can still be profitable. How far can it move? The point where losses turn to profit for a long vertical is the breakeven point. The point where profits turn to losses for a short vertical is also the breakeven point.

How can we quickly determine these breakeven points without creating a P&L chart or drawing the graph?

For a long vertical, the underlying stock has to move so that it's in-the-money by enough to pay for the spread. That means for a call vertical, it has to rally above the lower strike price, the strike price we're long, by the amount we paid for the spread. For a put vertical, it has to drop below the upper strike price, the strike price we're long, by the amount we paid for the spread.

For a short vertical, the underlying stock can move so that it's in-the-money by the amount we received for selling the spread. You can see this in Table 3.5.

The Necessary Price Action

In selling that call vertical spread, the market action that we need is very different than it would be if we bought the spread. A short call vertical is certainly profitable if the market moves lower, so we might think we want to call it bearish, but it is also profitable if the market moves sideways, and it's even profitable if the market moves up a little, so it's obviously not just bearish. As long as the market price for this stock stays below that lower strike price, 41 in this case, the call vertical will make the maximum profit, 0.77 in this case. In this case, the stock could rally from 40.56, where it was when we executed this spread, all the way up to 41.00 at expiration and still achieve maximum profit. That maximum profit trails off as the stock rallies above 41.00 until it reaches the breakeven price of 41.77. You can see that the payoff line in Figure 3.6 intersects 0 with the underlying stock at 41.77. That's the breakeven point, so the stock can even rally just short of 41.77 for this vertical spread to be profitable, although we'll enjoy a profit that's lower than the 0.77 maximum.

TABLE 3.5 Breakevens

Trade	Breakeven Point
Long a call vertical spread	Lower strike price + Cost of the spread
Short a call vertical spread	Lower strike price + Cost of the spread
Long a put vertical spread	Upper strike price – Cost of the spread
Short a put vertical spread	Upper strike price – Cost of the spread

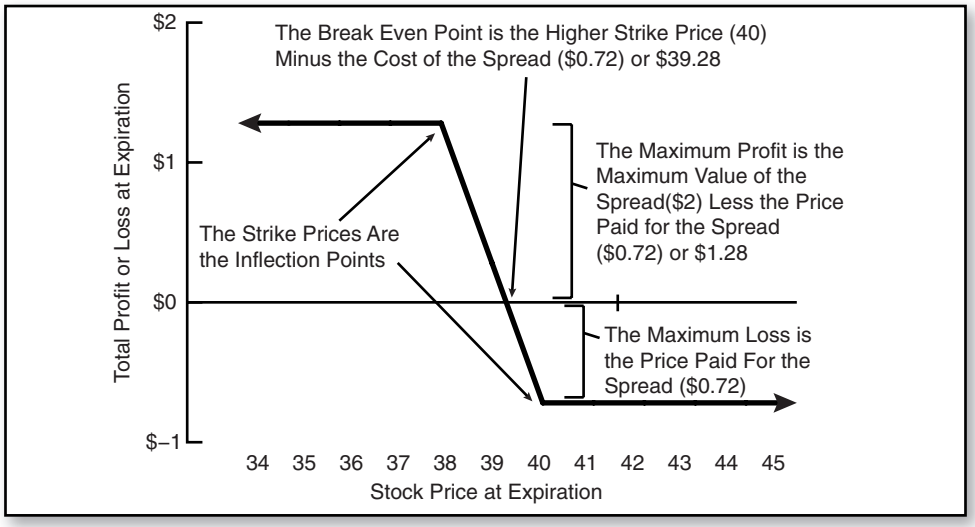


FIGURE 3.7 Payoff for Buying a Vertical Put Spread

The same sort of market action is needed for put vertical spreads. Previously, we looked at buying the July 40 put at 1.53 and selling the July 38 put at 0.81. Buying that vertical spread would cost us a net of 0.72 (1.53 – 0.81), and as you can see from the payoff chart in Figure 3.7, buying this put vertical means that this stock has to fall for the put vertical to be profitable. In fact, as you can see, it has to drop to 39.28 just to break even and doesn't become profitable until it has dropped below that level. You'd only execute this trade if you expected the stock to fall well below the 39.28 level.

If we had instead sold this July 38/40 put vertical (sold the July 40 put at 1.53 and bought the July 38 put at 0.81), we would have collected that 0.72 instead of paying it. Our outlook for the market would have been different if we had decided to establish this short put vertical trade, as this trade makes money if the underlying stock rallies, goes sideways, and even if it drops a little bit, as long as it stays above the 39.28 breakeven level, as you can see in Figure 3.8.

Vertical Spreads and Your Market Outlook

Buying an out-of-the-money vertical spread, either a call spread or put spread, means you have an affirmative outlook on the underlying stock, not necessarily a positive one in the case of a put vertical, but rather you think it's going to move and you've picked a direction. If you think it's going to rally, you might buy a call spread; if you think it's going to fall, you might buy a put spread.

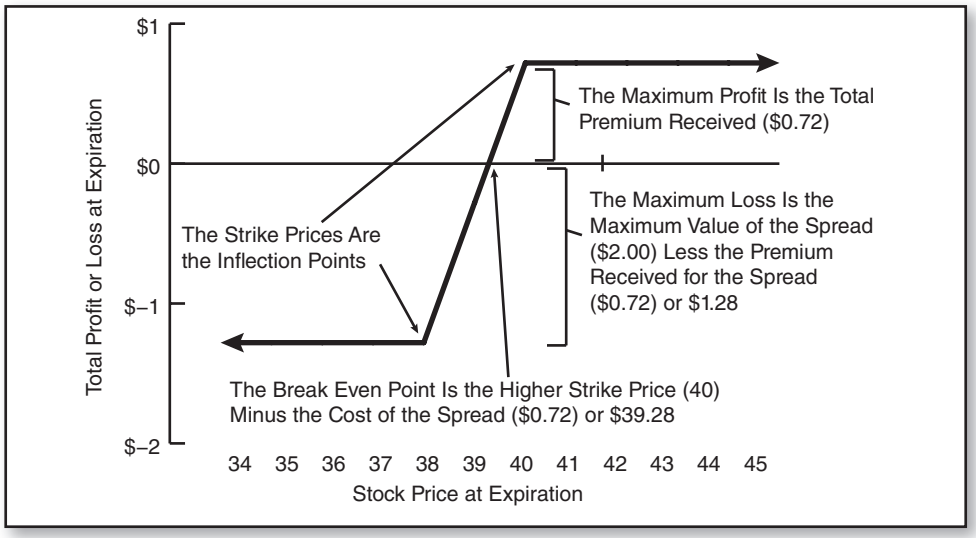


FIGURE 3.8 Payoff for Selling a Vertical Put Spread

Selling a vertical spread means you have a different sort of outlook. You think the stock is *not* going to do X, meaning it might do the opposite of X or it might do nothing. Just as the non-negative numbers include the positive numbers and zero, selling a vertical put spread makes money if the underlying stock goes up or if it does nothing. In fact, as we've seen from the previous payoff charts, there's even a margin of error where the underlying stock can do what we think it's not going to do, as long as it only does it a little bit. You can see that margin of error clearly if we take another look at the payoff chart for this short put spread in Figure 3.9.

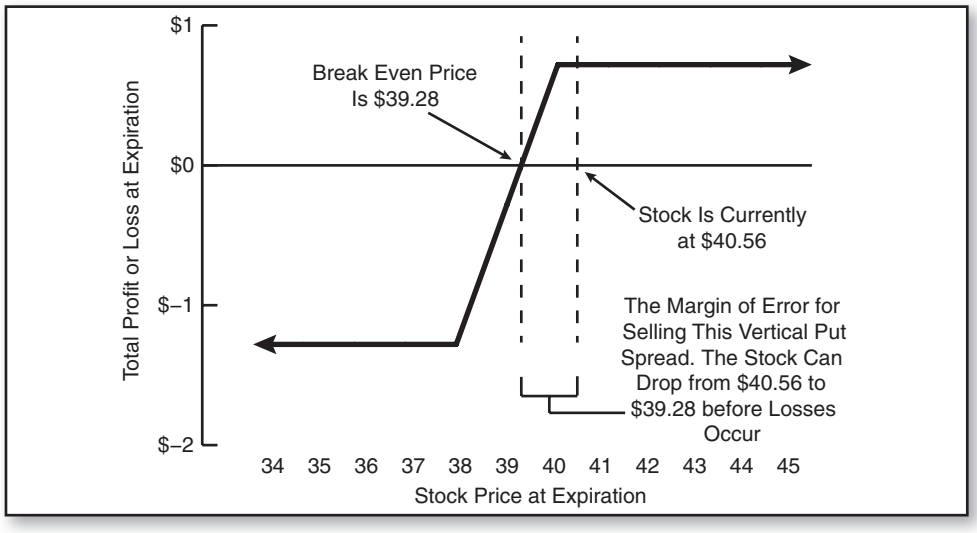


FIGURE 3.9 Short Put Vertical and the Margin of Error

TABLE 3.6 Out-of-the-Money Vertical Spreads and Market Expectations

	Long Vertical Call Spread	Short Vertical Call Spread	Long Vertical Put Spread	Short Vertical Put Spread
Market needs to:	Rally	Fall, move sideways, rally only slightly	Fall	Rally, move sideways, fall only slightly
You'd do if you were:	Bullish	Not really bullish	Bearish	Not really bearish

Compare this margin of error to the movement in the price of the stock that is required for a long vertical call spread to be profitable. We saw this required move clearly in Figure 3.6. This margin of error is the reason that vertical spread sellers are willing to risk more than they might make. On the other hand, the stock has to move in the right direction and get to at least the breakeven point for a vertical spread buyer to realize a profit. Since the odds of that are less than even, the vertical spread buyer demands a potential profit that is greater than their potential loss.

You can see these market outlooks and the vertical spreads you might use in Table 3.6.

Asymmetry of Risk and Reward for Vertical Spreads

As we've seen, when buying an out-of-the-money vertical spread, the sort of vertical spread we've been discussing, there's an asymmetry of the maximum risk and the maximum reward. This asymmetry exists in almost every option strategy; it's what makes options so very different from their underlying assets. Buy how is this asymmetry structured, and how can we use it to our advantage?

You might be tempted to think, "I always want to buy vertical spreads because I want to be in a situation where I can make many times what I might lose," even though we've seen that the stock has to move and has to move in the right direction and by at least the right amount. But what if someone offered you the sort of bet we see in this 41/44 call spread—you can buy the spread and risk 0.77 to make 2.23 or you can sell the spread and risk 2.23 to make 0.77—and you knew that the entire spread would expire with the likelihood of a certain value that we see in Table 3.7?

TABLE 3.7 Hypothetical Asymmetric Outcomes

Value of Spread at Expiration	Likelihood
0.00	90%
1.50	5%
3.00	5%

Remember that while our maximum profit would be 2.23 if we bought the spread, the value of the spread would be 3.00 if the stock were above 44.00 at option expiration. Obviously, in the real world, the spread could expire with a value as low as 0.00 and as high as 3.00 and any number in between, but to make the math easier in this example, we're limiting the outcomes to just three. These three outcomes and the relevant likelihoods mean the spread is worth:

$$\begin{aligned} & 0.00 \times 90\% = 0.000 \\ + \; & 1.50 \times 5\% = 0.075 \\ + \; & 3.00 \times 5\% = 0.150 \\ & 0.225 \end{aligned}$$

Given just these three potential outcomes and likelihoods, the spread is worth 0.225. If we knew that those were the potential outcomes and the likelihood of each, then we'd gladly sell this vertical spread at 0.77, even though it means risking 2.23 because the math tells us the spread is only worth 0.225 and the odds of losing a moderate amount of money (2.23 in this case) by selling the spread are very small.

Since the amount of money we can lose in selling a vertical is defined, and in this case is reasonable given the potential profit and the likelihoods, it's sometimes smart to risk more than you stand to make by selling vertical spreads. Readers of *Options Math* also know that, over time, options cost more than they're ultimately worth, meaning that there's an advantage to selling options. Just as your homeowner's insurer charges more than the coverage is worth (the difference covers their cost of doing business and provides a little profit), options, over time, cost more than they're worth; the price is greater than the value. The difference makes up for the asymmetry of payoffs for the option seller, but it's also something that the vertical spread seller can take advantage of. While the benefit is reduced in a vertical spread, it's generally positive. There are other phenomena discussed in *Options Math* that impact vertical spreads. Skew is one of those phenomena, and it generally helps vertical call spread sellers and vertical put spread buyers.

Option Delta and Likelihood

We've seen that we may be better off risking much more than we stand to make by selling a vertical spread. In our previous example, we made up some potential outcomes and likelihoods. But an option's delta gives us the market's expectations for the likelihood that option will expire in-the-money. Let's see if we can use those likelihoods to better understand how our vertical spread will perform.

Delta is the most basic greek, and it tells us two things simultaneously. First, it tells us how much the price of an option (or of a spread or combination if we do

TABLE 3.8 Call and Vertical Call Spread Deltas

Strike Price	June Call Option Price	Option Delta
38	2.90	84
39	2.15	73
40	1.52	60
41	1.00	46
42	0.65	32
43	0.40	21
44	0.23	12

some simple math) should change as the price of the underlying stock moves by $1. This is true because delta is also a measure of the likelihood that an option will be in-the-money at expiration. This means we can use the deltas of the options making up our vertical spread to determine the likelihood of each leg and of the entire spread being in-the-money (or out-of-the-money) at expiration (we couldn't use actual deltas in the hypothetical example with just three potential outcomes that we just looked at because delta assumes the spread can be at any price between 0 and 3.00 inclusive at expiration, not just one of three prices we examined). Let's check the deltas of the June calls we've been looking at. Your option broker will provide deltas as part of the option chain you see on their web site, or you can calculate them at www.OptionMath.com. You can see these deltas in Table 3.8.

We're long the June 41/44 vertical call spread, and we paid 0.77 for it. How much might we expect the value of our spread to change with each $1 change in the price of the underlying stock?

The delta of this call spread is 34 (46 – 12). We would expect the value of the spread to increase by 0.34 if the price of the underlying stock rallied by $1. We would expect the price of the spread to decrease by 0.34 if the price of the underlying stock fell by $1. We see how this plays out in Tables 3.9 and 3.10.

The value of this 41/44 call spread should change by 0.34 if the underlying stock changes in value by $1, although there are other factors that might result in the change's being slightly more or less than 0.34. The delta of each option will be different at the new stock price (due to the impact of gamma we

TABLE 3.9 Our Vertical Call Spread after the Underlying Stock Has Rallied

Underlying Stock Price Rallied $1 to:		41.56
Strike Price	**New Option Value**	**Profit/Loss**
41	1.46	0.46
44	0.35	–0.12
Profit/loss for the entire spread		0.34

TABLE 3.10 Our Vertical Call Spread after the Underlying Stock Has Fallen

Underlying Stock Price Fell by $1 to:		39.56
Strike Price	**New Option Value**	**Profit/Loss**
41	0.54	–0.46
44	0.11	0.12
Profit/loss for the entire spread		–0.34

discussed earlier), so the net delta won't be 34 anymore, and for this reason, we can't precisely know what the value of the spread would be if the underlying stock moved by more than $1.

More importantly, can we use these deltas to help us figure out what the market says the likelihood of these options and this spread being in-the-money and out-of-the-money are at expiration? Certainly, that's the other thing that delta tells us.

Based on the deltas we saw in Table 3.8, we know that the market says there's a 46 percent likelihood that the 41 call will be in-the-money at expiration. That likelihood makes sense because the underlying stock was at 40.56, which is very close to 41. The odds of its rallying from 40.56 to over 41 at expiration are close to 50 percent.

The delta of the 44 call is lower, and that makes sense as well because the likelihood of the underlying stock's rallying past 41 and getting above 44 is obviously less than the 46 percent likelihood of the underlying stock's simply being above 41 at option expiration, remembering that it could be above 41 and below 44.

The market tells us that the likelihood of the underlying stock's being above 44 at option expiration is 12 percent. In order for this vertical spread to be fully in-the-money at expiration, the 44 call has to be in-the-money. We know the likelihood of that is 12 percent.

What is the likelihood that the spread will at least break even if we buy it? That is similar to determining the chance that the stock will be above 44 at expiration, but instead of its being above 44, we wonder what the odds are that it will be at or above the 41.77 breakeven price that we calculated before. We can use the tools at www.OptionMath.com to calculate the delta of a hypothetical option with a strike price equal to 41.77. If we do that, we find the delta of that option is 35, meaning the likelihood of its being in-the-money at expiration is 35 percent. That's the likelihood that the spread will at last break even for the call spread buyer.

And what does this tell us about the price of this spread versus the value of this spread? The spread costs 0.77 and has a maximum potential profit of 2.23. The odds of at least breaking even are 35 percent. You can see all these likelihoods in Figure 3.10. Now that we've shown you how to determine them for buying a call vertical spread, you should be able to determine them for any vertical spread, long or short, call or put.

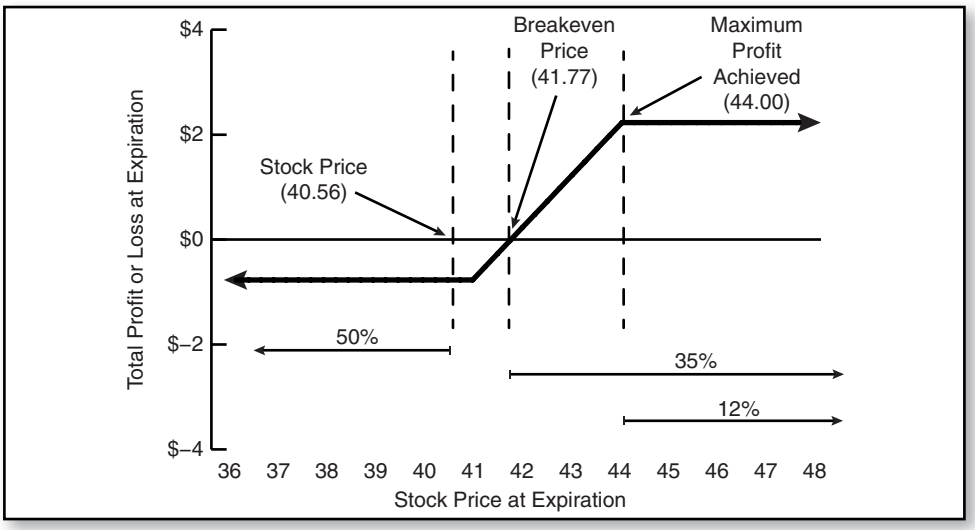


FIGURE 3.10 Payoffs and Likelihoods for Buying a Vertical Call Spread

Let's do the same analysis for the July 38/40 put spread we were thinking about buying. In Table 3.11, we see the put option prices and deltas.

If we bought that vertical put spread, we would buy the 40 put at 1.53 and sell the 38 put at 0.81. We'd pay a net of 0.72, and that would be our maximum loss. Our maximum potential profit would be the maximum value of the spread, 2.00 (40 – 38), minus what we'd paid for the spread (0.72), for a maximum profit of 1.19 (2.00 – 0.72).

The delta of the put spread would be 15 (29 – 14). Some option users will refer to a put delta as a negative number since the price of the option will decrease by the delta if the price of the underlying stock rises. I don't like that. The delta is really two measures. First, it's the amount by which the option will change in price if the underlying stock moves by $1.00, regardless of whether the stock moves up or down.

TABLE 3.11 Put and Vertical Put Spread Deltas

Strike Price	July Put Option Price	Option Delta
38	0.81	14
39	1.13	20
40	1.53	29
41	2.04	41
42	2.65	53
43	3.33	66
44	4.08	77

The option price can't move by a negative number. It can move down, but saying it can move by a negative number is a little like telling you to walk north by negative three miles. What I'm probably saying is to walk south by three miles, but you can't walk negative miles and a stock can't move by a negative amount. Second, the delta is the percentage likelihood that the option will be in-the-money at expiration. Every likelihood is greater than or equal to zero.

So the delta of the put spread is 15. We'd expect the price of the spread to change by 0.15 if the underlying stock moved by $1.00. Since it's a put spread, it would move in the opposite direction of the underlying stock. If the underlying stock fell by $1.00, then we'd expect the price of the put spread to increase by 0.15. If the underlying stock rallied by $1.00, then we'd expect the price of the put spread to fall by 0.15. As we said before, after that move, the deltas for these options will have changed (they will actually be changing slightly as the stock is making that $1.00 move), so after the move the delta will no longer be 15. It's also possible that other factors mean the price of the spread won't have changed by exactly 0.15, but with other inputs unchanged we'd expect the price of the spread to change by 0.15.

What's the likelihood that the entire spread will be in-the-money at expiration? That would require the underlying stock to be below 38 at option expiration, and the likelihood of that happening is exactly what the delta of the 38 put tells us: the odds of that happening are 14 percent.

The breakeven for this vertical put spread is 39.28. What are the odds that the stock is below 39.28 at July expiration? While there's no option struck precisely at 39.28, we can again use the tools at www.OptionMath.com to find that the delta of this hypothetical put option is 23. That's the percentage likelihood that the stock will be below 39.28 at July expiration.

Vertical Spread Value Prior to Expiration

So far, we've looked at what a vertical spread will be worth at expiration. We do this in part because it helps to explain the concepts and because it's possible to know precisely what any vertical spread will be worth at expiration given any price for the underlying; we can construct the sort of P&L chart that we saw previously and do some simple arithmetic. We also look at what the spread is worth at expiration because it's impossible to know with certainty what the spread will be worth prior to expiration. We can put some variables into the tools available at www.OptionMath.com and get a really good estimate of what the spread will be worth, but it's an estimate because we don't know exactly what each individual option will be worth. The amount of volatility that the market will estimate for the remaining life of the option is the unknowable variable.

What is our spread likely to be worth prior to expiration? At expiration our 41/44 call spread was worthless if the underlying stock was at 40.75. What if the underlying stock was at 40.75 but there were 20 days to expiration? Would you be willing to pay something for the spread then? Probably, because all the underlying stock would have to do is rally a little for the spread to have some sort of inherent value. If the underlying rallies by 0.50, then the spread is inherently worth 0.25. And given 20 days to expiration, that just might happen.

At expiration our 41/44 call spread was worth 3.00 if the underlying stock is at 44.25. With 20 days to expiration and the underlying stock at 44.25, would you be willing to pay $3.00 for this spread? Probably not, because there's zero potential for profit. Even if it were a metaphysical certainty that the underlying stock was going to be at 44.25 at expiration 20 days hence, you wouldn't pay $3.00 for the call spread because you'd lose money after commissions. And in the real world, there's always the possibility that the underlying stock won't be at 44.25 at expiration. If it falls back below 44.00, then the spread is going to be worth less than $3.00, so there's no reason to pay the maximum value for a spread, particularly if there's time left to expiration.

What is the value of a vertical spread prior to expiration? Figure 3.11 shows the linear payoff at expiration that we're familiar with and also shows the curved payoff line for this spread with 45 days to expiration.

If immediately after buying this call spread the underlying jumped to 45.00, we'd have a profit, but the spread wouldn't be worth the maximum value of 3.00 like it would be if it were at 45.00 at expiration. At 45.00, assuming nothing else changed

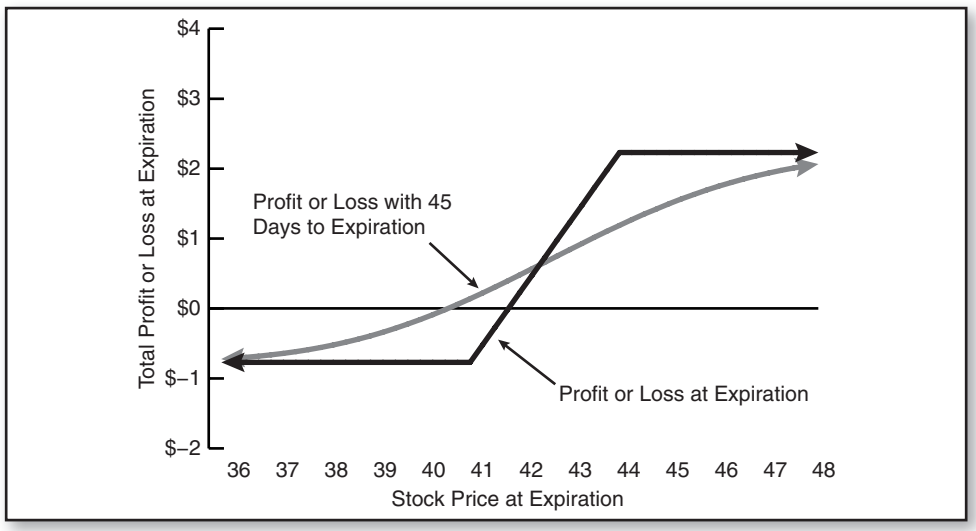


FIGURE 3.11 Payoff for a Long Vertical Call Spread and Value Before Expiration

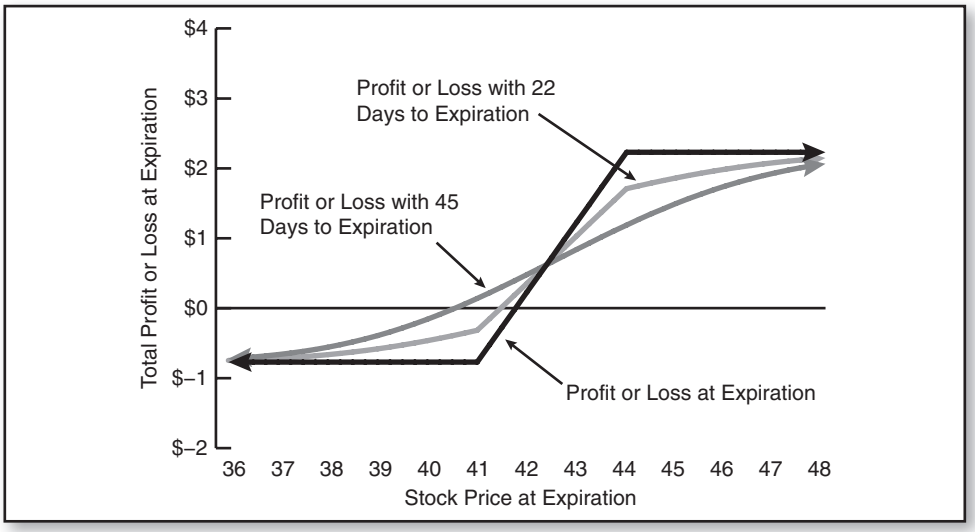


FIGURE 3.12 Payoff for a Long Vertical Call Spread and Value before Expiration

(pretty unlikely, but a necessary assumption for us to generate some hypothetical option prices), the spread would be worth 2.27, so our unrealized profit would be 1.50 (2.27 – 0.77). This changes things for us. We now want expiration to arrive as quickly as possible because along with expiration, we're going to get the maximum value of the spread. The value of the spread will change over time, and the curved line that we see in Figure 3.12 will become more like the angular payoff at expiration that we see. That's the important consideration—as time passes, the curved line will become more angular until it exactly matches the payoff at expiration. In Figure 3.12 you see how the curved payoff line for our spread with 45 days to expiration becomes angular with 22 days to expiration as the payoff is on its way to being completely angular at expiration.

While long the 41/44 call spread after the underlying stock has jumped to 45, we're waiting for the curved line to move higher as time passes.

This vertical call spread is no longer an out-of-the-money vertical and is now an in-the-money vertical. In-the-money spreads behave differently, and we'll discuss them more later in this chapter.

If immediately after buying this call spread the underlying fell to 39, then the spread would fall in value, but since there's still time left in the options, the value of the spread wouldn't fall to zero. Instead, the spread would be worth 0.38 (again assuming nothing else changed) meaning we would have an unrealized loss of 0.39 (0.77 – 0.38). This spread is still an out-of-the-money spread; it's just more out-of-the-money now, and it still needs a rally in the underlying stock in order to be profitable.

The Other Greeks

We saw that the delta for a vertical spread was very similar to the delta for an outright option, just a little smaller. The delta of the July 40 put we looked at was 29, while the delta of the July 38/40 vertical put spread was 15. The put spread will increase in value as the underlying stock drops, just like the outright put.

The same is true for the other greek we focus on: theta, the expected daily erosion of option value; the net theta of the vertical spread will be less than the theta of the July 40 put alone. Each option in a vertical spread will erode over time, and as we saw in Chapter 2, the erosion doesn't happen in a straight line. Thus, the erosion of our long vertical put spread won't happen in a straight line either, although the exact shape of the erosion chart is dependent on how far out-of-the-money each option is. Table 3.12 shows the theta for each of the July puts we looked at earlier.

The July 40 put would be expected to erode by about 2 cents today. That erosion will accelerate as expiration nears, but for the July options, expiration is still 45 days away. The July 38 put would be expected to erode by about 1.7 cents today; again, that erosion would speed up as expiration neared. But look at the net expected erosion for our vertical put spread—it's only 0.3 cents today.

If nothing else changed, how would we expect that daily theta to change as time passed and we got closer to expiration? Figure 3.13 shows the theoretical erosion for both options and for the option spread if nothing changed but time to expiration. Notice that as time passes, the erosion for the out-of-the-money leg, the 38 put in our case, falls off. That's because it's too far out-of-the-money. The at-the-money leg, however, doesn't see this happen because it's always close to at-the-money.

This means that the theta, or daily erosion, for the put spread really accelerates as expiration approaches. It even accelerates faster than the erosion for the at-the-money option alone because the erosion of the out-of-the-money option is actually trailing off. When the change in theta starts to go in opposite directions, then this trade ceases to be a real spread. It's certainly true that the risk is defined if you sell

TABLE 3.12 Put and Vertical Put Spread Theta

Strike Price	July Put Option Price	Option Theta
38	0.81	0.017
39	1.13	0.019
40	1.53	0.020
41	2.04	0.021
42	2.65	0.020
43	3.33	0.019
44	4.08	0.017

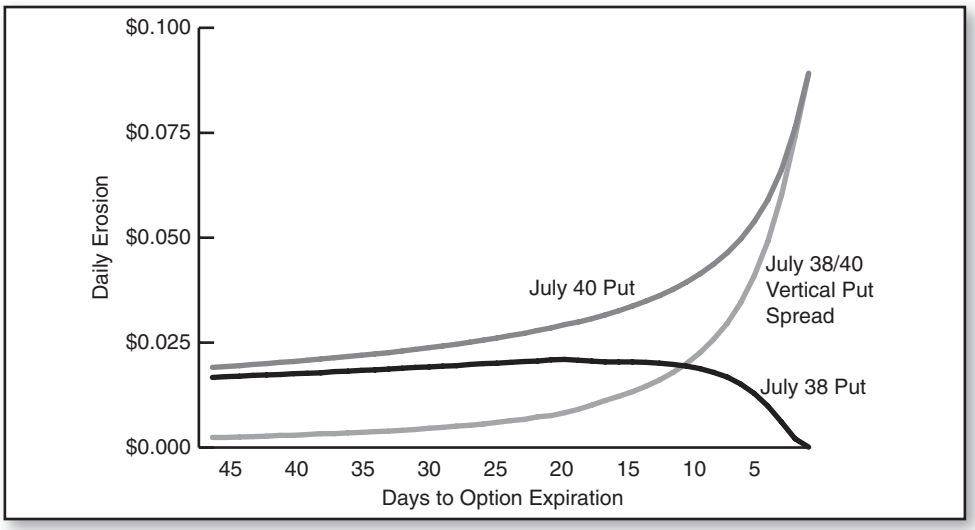


FIGURE 3.13 Put Spread Theta

it, but each option starts to act differently than the other. This can happen to any "spread" if the strike prices are too far apart or if the options are close to expiration, as in this case.

What does this mean about how we should trade vertical spreads? It means that the net erosion for a vertical spread that has a moderate amount of time to expiration is really small. This is great if you're long a vertical spread but not good if you're short a vertical spread. It also means that the erosion for a vertical spread can really accelerate as expiration nears. With less than 15 days to expiration, the net daily erosion of our vertical put spread is picking up speed. It will never be quite as high as the daily erosion for the at-the-money option by itself, but the erosion for the spread will eventually become very close to that for the outright at-the-money option. This increase in erosion for vertical spreads is great if you're short a vertical spread, but not good if you're long. This is the case because the out-of-the-money leg, the leg that defines the risk of the vertical spread if you are short the spread, has eroded almost to zero and the erosion slows while the erosion for the at-the-money option accelerates.

The Best Measure of Vertical Spread Cost

The very first vertical call spread we looked at, the June 41/44 vertical call spread, could be traded for about 0.77. Is that a good price? For the buyer or the seller? The 42/43 vertical call spread could have been traded for about 0.25. That's certainly cheaper, but is it a better deal for the buyer?

TABLE 3.13 SPY Put Prices and Vertical Put Spreads

Strike Price	July Put Option Price	Cost of the Vertical Put Spread with This Option and 160 Put	Cost of the Vertical Put Spread as a Percentage of the Width of the Spread	Likelihood of Being Fully In-the-Money at Expiration
130	0.02	1.87	6.23%	2%
135	0.03	1.86	7.44%	3%
140	0.06	1.83	9.15%	5%
145	0.12	1.77	11.80%	8%
150	0.29	1.60	16.00%	14%
155	0.76	1.13	22.60%	24%

This leads to the question: how do we measure the cost of a vertical spread? That 41/44 call spread cost 0.77, but the 42/43 spread cost less than a third of that. Which is the better deal?

We have to look at the spread in another way to determine the better deal. This is where your outlook for the market becomes important. We saw previously that for the buyer of the 41/44 call spread, the maximum profit is achieved with the underlying stock at or above 44 at June expiration. That means you'd certainly look at a different strategy or a different spread if you thought the underlying was going to get all the way to $50 by June expiration.

One great measure of the cost of a spread, with one important caveat, is to compare the cost of the spread to the width of the spread. The 41/44 vertical call spread could be traded for 0.77. That spread is $3 wide (44 – 41), so the cost is 25.67 percent of the width of the spread. That's pretty cheap for a spread with a long leg that was just barely out-of-the-money. And that's the important caveat. Vertical spreads will become cheaper, as a percentage of the width of the spread, as they get further from at-the-money. This makes sense because the odds of the spread being profitable are falling.

First, let's look at another underlying, one with more strike prices, so we can look at a bigger range of vertical spreads and see how the cost, as a percentage of the width of the spread, changes as the spread gets wider. We see this in Table 3.13.

As you can see, the cost of these vertical spreads, as a function of the width of the spread, decreases as the width increases. That makes sense. The likelihood of collecting the full width of the spread is pretty remote for those wider spreads.

In-the-Money Vertical Spreads

So far, we've looked at out-of-the-money vertical spreads almost exclusively. But what about in-the-money vertical spreads? While you might never initiate an in-the-money vertical spread—and there are good reasons you'd never initiate an

TABLE 3.14 In-the-Money Call Spread and Out-of-the-Money Put Spread

Strike Price	Call Option Price	Put Option Price	Value of Call Spread	Value of Put Spread
70	30.25	0.25	9.75	0.25
80	20.50	0.50		

in-the-money vertical, as we'll see later, how should you look at the trade if the market moves and the vertical spread you have is now in-the-money?

The wonderful symmetry of puts versus calls comes into play here, making it really easy to understand your in-the-money vertical spread. Being long an in-the-money call vertical spread is exactly the same as being short an out-of-the-money put vertical spread with the same strike prices. Being long an in-the-money put vertical spread is exactly the same as being short an out-of-the-money call vertical spread.

How is this? Let's look at some prices to make certain this is correct. The prices we see in Table 3.14 are theoretical, but let's assume the price of the underlying was 100.00.

How can being long that call spread (long the 70 call and short the 80 call), the one that costs 9.75, be like being short that put spread (being long the 70 put and being short the 80 put), the one that costs 0.25?

Let's look at the maximum profit and loss and where they occur. What is the maximum potential profit if you buy that call spread and pay 9.75 for it? The maximum that the call spread can be worth is 10.00 (80 – 70) so the maximum profit is 0.25 (10.00 – 9.75). That maximum profit is realized with this stock above 80 at option expiration. What's the maximum loss if you buy that call spread? The maximum loss is what we pay for it, 9.75, and that's realized with this stock below 70 at option expiration.

What's the maximum profit from selling the put spread? The maximum profit from selling a vertical spread is the net premium received, 0.25 in this case. That maximum profit is realized with the stock above 80 at option expiration. What's the maximum loss from selling that put spread? The maximum loss is the width of the spread, 10.00, minus the premium received. That maximum loss is 9.75 (10.00 – 0.25), and it's realized with the stock below 70 at option expiration. We can see this in Table 3.15.

TABLE 3.15 Vertical Spread Symmetry

Spread	Maximum Profit	Realized at Expiration with Stock	Maximum Loss	Realized at Expiration with Stock
Long 70/80 call spread	0.25	Above 80	9.75	Below 70
Short 70/80 put spread	0.25	Above 80	9.75	Below 70

These two trades, long the 70/80 call spread and short the 70/80 put spread, are identical. This isn't just a neat trick; it can help us when it comes time to trade. How? By reducing the cost of closing the trade. Those deep in-the-money options are going to have bid/ask markets that are really wide. While the problem of bid/ask spread is somewhat alleviated by executing your closing trade as a spread, it's still likely to be wider for the in-the-money spread than for the out-of-the-money spread. Let's look at some actual option prices to see how this works. The underlying was at 121.65 when the option prices in Table 3.16 were observed.

We can see from these prices that if we wanted to sell our 95/105 call spread and we simply sold the 95 call at the bid and bought the 105 call on the ask, we'd get 9.05 (26.35 – 17.30). Okay, maybe that's what the spread is worth. But let's see if those markets make sense for us by looking at what it would cost to buy that spread in the same way—buying the 95 call at the ask and selling the 105 call on the bid. If we did that, we would pay 10.20 (27.05 – 16.85) for a spread that can only be worth a maximum of 10.00. Maybe those wide bid/ask markets don't make sense for us after all. Maybe they only make sense for the market maker.

Since selling the 95/105 call spread (selling the 95 call, buying the 105 call) is identical to buying the 95/105 put spread (selling the 95 put, buying the 105 put) can we buy the 95/105 put spread to close the long position we have in the call spread? Would we save money doing so? Let's see. If we did that, we would end up with a position that looked like:

Long 95 call
Short 95 put
Short 105 call
Long 105 put

Being long the 95 call and short the 95 put is just like being long the stock. Being short the 105 call and long the 105 put is just like being short the stock. The two strikes will cancel each other out, meaning that buying the 95/105 put spread will effectively close the long position in the 95/105 call spread. Will it save us money?

TABLE 3.16 **In-the-Money Bid/Ask Spreads versus Out-of-the-Money Bid/Ask Spreads**

Option	Option Bid	Option Ask
95 put	0.06	0.18
95 call	26.35	27.05
105 put	0.40	0.42
105 call	16.85	17.30

If we were to buy that put spread, we would pay 0.36 (0.42 – 0.06), and all of that 0.36 would be time value because the options were out-of-the-money. If we sold that call spread to close, we would have collected 9.05, but how much of that would be time value? By selling the 95 call at 26.35, how much time value would we be collecting? The underlying was at 121.65, so that option has an inherent value of 26.65. Oops, we sold that at 26.35, so we sold the option for less than its inherent value. We paid 17.30 for the 105 call when the option had an inherent value of 16.65, so we paid 0.65 in time value. Factor in the 95 call that we sold for less than its inherent value, and it looks like we surrendered 0.95 in time value by selling the call spread rather than surrendering 0.36 in time value for buying the put spread.

Another way to examine this is to imagine that we'd paid $1.00 for that call spread a long time ago because we thought the underlying stock was going to rally. We didn't think it was going to rally all the way to 121.65 or we wouldn't have sold the 105 call to make a spread, but we got the direction correct. What would be our total profit on the trade if we closed it by selling the call spread versus buying the put spread?

We paid $1.00 for the call spread and sold it for 9.05. Our profit is 8.05.

We paid $1.00 for the call spread and bought the closing put spread at 0.36. This leaves us long the 95 call and short the 95 put, which is like being long the stock at 95.00. It also leaves us short the 105 call and long the 105 put, which is like being short the stock at 105.00. We collect a net of 10.00 from the option positions at expiration, the original trade cost $1.00 and we paid 0.36 in buying the put spread to close. That profit is 8.64 (10.00 – 1.00 – 0.36). We made an extra 0.59 by closing the trade with the put spread rather than the call spread. Given the limited reward potential of a vertical spread, traders can't afford to squander 0.59 on a trade that had limited upside to begin with.

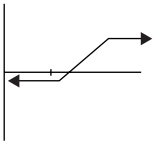
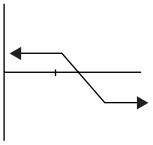
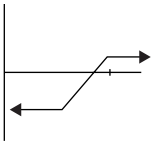
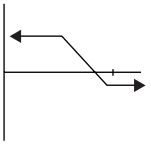
The caveat? By selling that put spread, we're left with the position we saw previously:

Long 95 call
Short 95 put
Short 105 call
Long 105 put

This is only a problem if the underlying stock drops a bunch and is near one of those strike prices at expiration.

Then you may not know if you'll be assigned on your short leg, so you won't know whether to exercise your long leg. This is called getting "pinned" as the underlying stock price is pinned at the strike price. What do you do if the underlying stock has dropped and is now at your strike price? We'll discuss that when we talk about conversions and reversals in Chapter 13.

Vertical Spread Cheat Sheet

	Long Call Vertical Spread	Short Call Vertical Spread	Long Put Vertical Spread	Short Put Vertical Spread
Description	Long call, short further OTM call	Short call, long further OTM call	Long put, short further OTM put	Short put, long further OTM put
Example	ATM = 100 Long 105 call Short 110 call	ATM = 100 Short 105 call Long 110 call	ATM = 100 Long 95 put Short 90 put	ATM = 100 Short 95 put Long 90 put
Pay or Collect Premium	Pay	Collect	Pay	Collect
Needed Directionality				
Passage of Time without Market Movement	– –	+ +	– –	+ +
Increase in Implied Volatility without Market Movement	+	–	+	–
Payoff Thumbnail Chart				
Maximum Risk	Cost of the spread	Width of the spread minus premium received	Cost of the spread	Width of the spread minus premium received
Maximum Profit	Width of the spread minus premium paid	Premium received	Width of the spread minus premium paid	Premium received
Breakeven Points	Long strike plus premium paid	Long strike plus premium paid	Long strike minus premium paid	Long strike minus premium paid

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CHAPTER 4

Covered Calls

You probably own stocks. If you do, and someone was willing to pay you money now but they got a portion of the potential appreciation of that stock, the appreciation above a certain level if your stock rallied within a certain time period, would you take that deal? Would you take their money now and sell a portion of your future potential appreciation? You might if you liked the stock for the long term but thought that it was going to be stuck in neutral for some time, either because of the stock itself or because of the broader market. Or you might just think that the value of the cash now is greater than the value of the appreciation you're potentially giving up once you've discounted what you might give up by the probability that you actually have to give it up.

This deal, you receiving cash now and giving up a portion of the potential appreciation of a stock you already own, would look something like Figure 4.1.

Would you be willing to make that trade, giving up potential appreciation above 60.00 for 0.57 in cash now given that the stock is at 58.50? What if I told you the odds of giving up *any* appreciation above 60.00 were only 33 percent and that the odds of giving up more appreciation than you've received in cash were only 27 percent? Would you make the trade now? You might choose not to if you thought the market was wrong and that the stock was going to appreciate above those levels or you might opt not to because you're getting a finite sum now in exchange for what might be a much larger sum if the stock appreciates substantially. But you might be willing to make that trade if you liked those odds or if you thought the stock was going to go sideways or up only slightly during the next few weeks or if you recognized that a stock can rally substantially but that such a movement is relatively rare.

This trade, selling away some potential appreciation on stock you own in exchange for receiving cash now is a covered call. And the hypothetical chart we

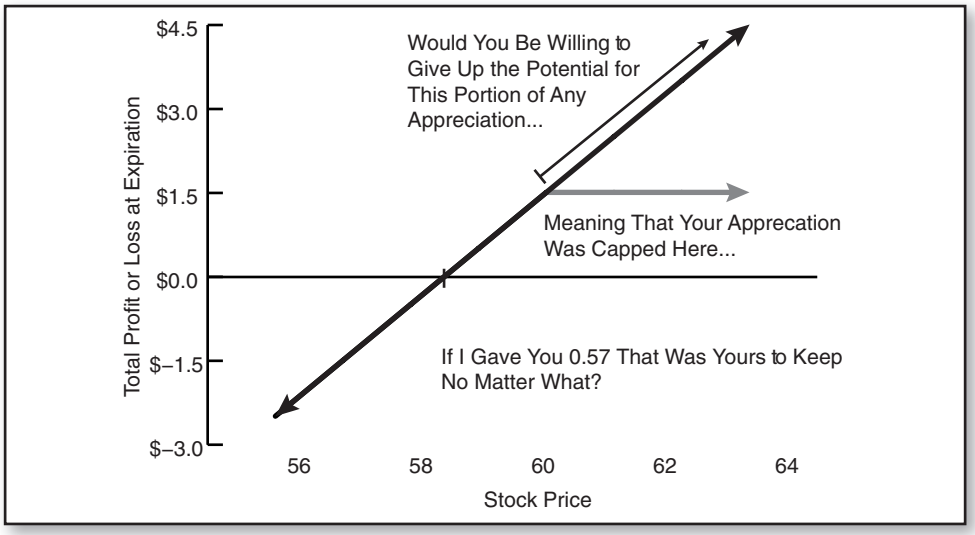


FIGURE 4.1 Would You Make This Trade?

looked at above? It's the real chart for a 60 strike covered call we might execute if we owned JPM stock, which was then at 58.50. How would this chart look if we added the naked stock payoff line to the payoff line for the combination trade, which includes the 0.57 in cash we would collect for our new combination trade of long JPM stock and short the 60 strike covered call. We see this in Figure 4.2.

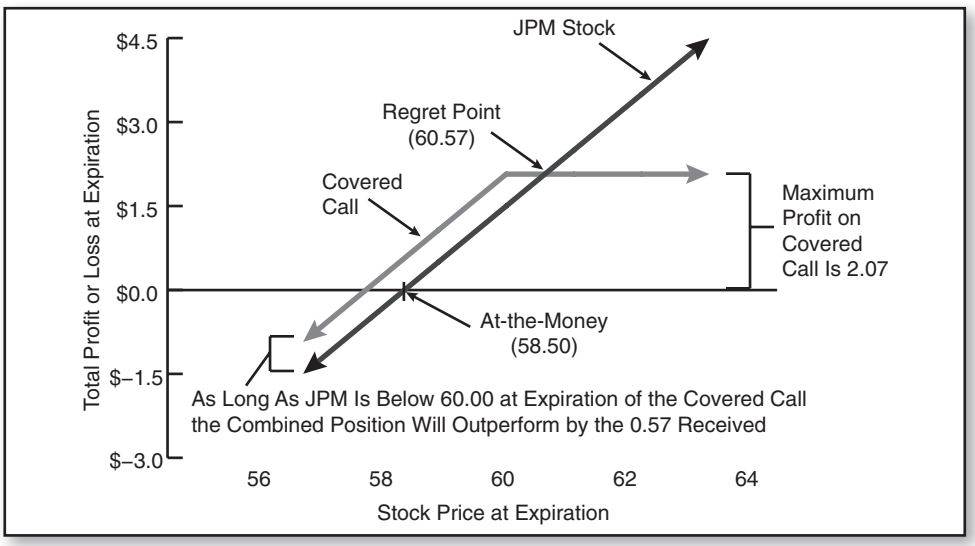


FIGURE 4.2 The 60 Strike JPM Covered Call

A covered call is a combination of long stock, preferably stock you already own, and a short call option on that stock. As the seller of the covered call, you collect and keep the option premium. We'll refer to the combined position as a covered call, although it is sometimes called an *overwrite*. Another term that you might see, *buywrite,* is slightly different because a buywrite is the simultaneous purchase of the underlying stock and sale of the covered call. You might think this is the trade to make if you don't already own the stock, but there's no reason to pay two commissions, one to buy the stock and the second to sell the covered call, when the exact same exposure can be created by simply selling a covered put. We discuss this more in Chapter 5 when we discuss covered puts. Since there's no reason to pay two commissions, in this chapter we'll focus on selling calls on stock that we already own, which means we'll focus on covered calls, also known as overwrites.

The advantage of a covered call is that the covered call seller collects and keeps the option premium. Over time, the premium received will be greater than the value of the option given; the option price received by us as the covered call seller is, over time, greater than the option value we give in the form of volatility or potential appreciation. When we say "over time," we mean that given a large number of observations, enough to eliminate pure luck as a factor, the price of the option will be greater than the value of the option. This won't be the case each and every time, and it's entirely possible that you'll end up selling a covered call for less than it's ultimately worth, either in volatility terms or in terms of the option's value at expiration, but, in general, options cost more than they're worth. For a more complete discussion of this phenomena see Chapter 5 of *Options Math for Traders.*

The premium received generates outperformance over a substantial range of potential stock prices at option expiration meaning that the combined position (long stock and short the covered call) will outperform the naked stock by the amount of call premium received as long as the stock is at or below the strike price of the call at expiration. You can see this in Figure 4.2. The combined position outperforms the naked stock position by the 0.57 received with JPM anywhere at or below 60.00, the strike price of the covered call, at option expiration. Above 60.00, the owner of the call will exercise the call and buy the underlying stock from us at 60.00, meaning that the outperformance diminishes and eventually turns into underperformance as the combined position ceases to appreciate above there.

But even if the underlying stock is above that call strike price at expiration, the covered call seller gets to keep the premium he collected, 0.57 in this example. At some point as the outperformance diminishes the premium collected is equal to the appreciation that we sold away. This is the point where the underlying stock is above the strike price by precisely the option premium received. In the case of our JPM covered call, that point is reached at 60.57 (the 60.00 strike price plus

the 0.57 in option premium received). At this point, where the premium collected equals the appreciation that was surrendered, the covered call seller is indifferent to the two positions, long the stock or long the stock and short the covered call. At this point, the two outcomes generate the same profit, but above this level the covered call seller regrets selling the covered call, the appreciation surrendered is now greater than the call premium received. We call this point of indifference, the point where the stock is above the strike price by precisely the amount of option premium received, the *regret point*. Above here, the covered call seller regrets selling the covered call. The regret point is always equal to the strike price plus the option premium received. You can see the regret point of 60.57 for our JPM covered call in Figure 4.2.

With the underlying stock at the regret point, the only difference between the combined covered call position and the naked stock position is that the naked stock position will remain long the stock after expiration, while the combined covered call position will have the stock called away and will instead have $60.57 in cash per share. Since JPM is trading at 60.57, we could very easily exchange our cash for shares of stock by buying the shares back meaning the two positions are equivalent to each other right now.

Covered call sellers get paid when they sell the call; the premium is theirs to keep, but the goal is to have the call option expire worthless. When that happens, the potential of giving away any appreciation has expired and the shareholder can sell another covered call, sell his stock, not sell a covered call if he thinks the stock is now going to rally above the strike price of the covered call he might sell, or use another strategy. Since he wants the option to expire worthless, the covered call seller gets paid when he sells the covered call but "earns" that money through daily erosion for the term of the option.

The 60 strike covered call we sold in JPM had 30 days to expiration. Since shorter-dated options erode more quickly than longer-dated options, we generally want to sell shorter-dated options, and this is true for covered calls.

Let's look at how this 60 strike call with 30 days to expiration will erode over time. You can use the tools at www.OptionMath.com to calculate the erosion for any option you're thinking of buying or selling. We see the expected price for this option as it erodes in Figure 4.3.

The first thing you'll notice is that this option doesn't erode in the same parabolic way that we saw some options erode previously. That's because this option was 1.50 out-of-the-money, and given that the underlying was at 58.50, that's over 2.5 percent out-of-the-money, quite a bit for a low volatility (17.02 percent) name like JPM that doesn't have a catalyst before the option expires. The result is this more straight-line erosion for the last 30 days of its life. But this straight-line erosion for the final 30 days is an illusion because the 60 strike option is out-of-the-money. If we

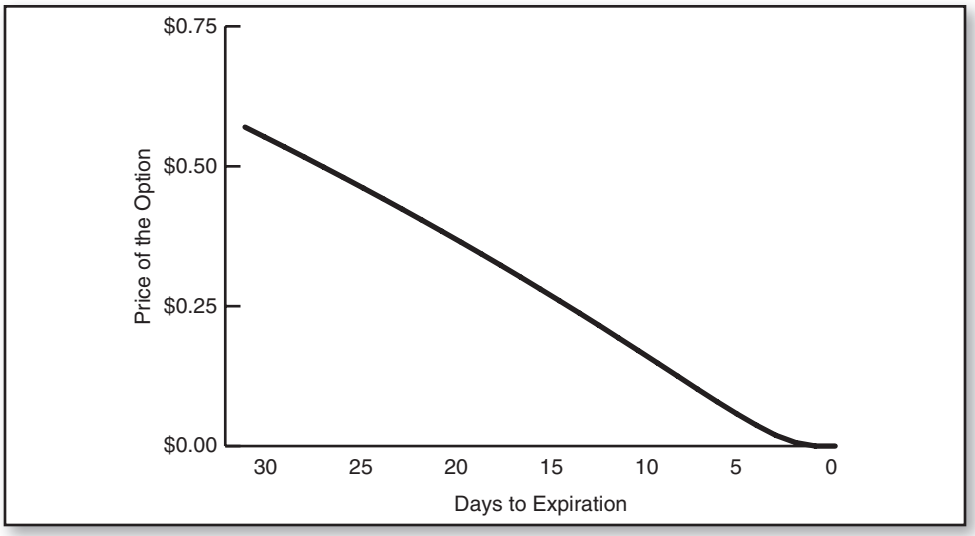


FIGURE 4.3 JPM 60 Strike Covered Call Price by Time to Expiration

look at this option over a longer term, we see the characteristic erosion we expect. We see this in Figure 4.4.

If we're in the final 30 days of the option's term, then the "big picture" of erosion gets blurry.

Since erosion is so important to so many option strategies, let's look at how other options that are in-the-money or at-the-money or farther out-of-the-money should erode over the 30-day period we're interested in. We can see this in Figure 4.5.

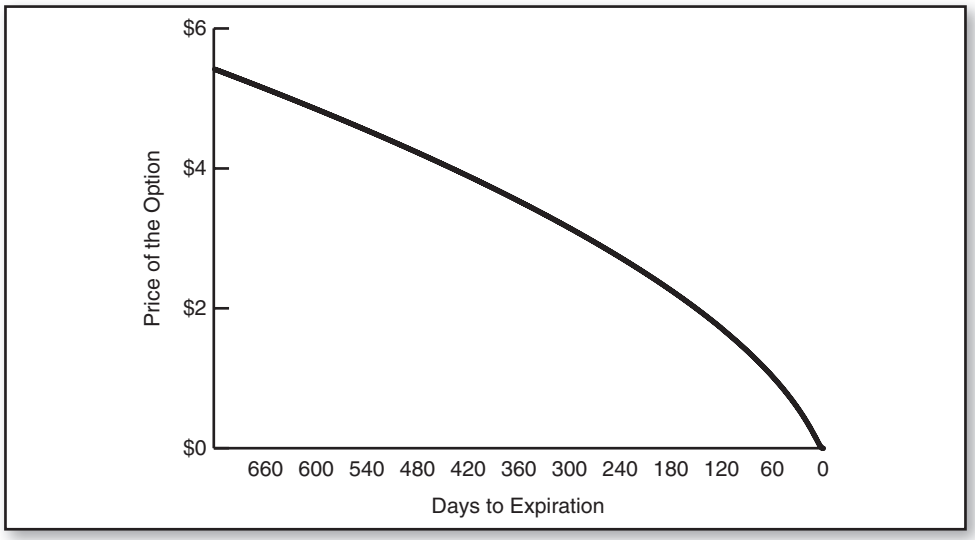


FIGURE 4.4 Our Covered Call over a Longer Time Period

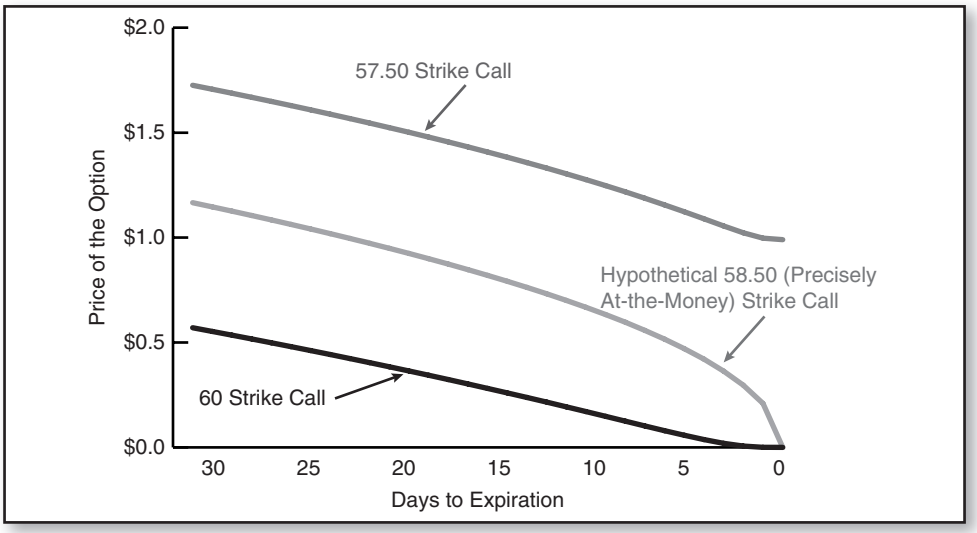


FIGURE 4.5 Covered Call Price by Time to Expiration for Several Strike Prices

The 57.50 call will never erode all the way to zero, assuming JPM stays at 58.50, because it's in-the-money, it has $1.00 of inherent value, and that inherent value will not erode away, but its time value does erode, along with the out-of-the-money 60 strike call we already looked at, in more or less a straight line. They're both too far from at-the-money to evidence the parabolic erosion that we saw previously, including in Figure 4.4, but that doesn't mean we shouldn't focus on shorter-dated options when selling options, including covered calls. If we were to go to the tools at www.OptionMath.com, we would find this covered call has an implied volatility of 17.02 percent (given 30 days to expiration, an underlying price of 58.50, and a risk-free rate of 1 percent. Since no dividends were due to be paid during the term of this option the dividend yield is zero). Leaving all those inputs fixed but changing the time to expiration we find the theoretical option values in Table 4.1.

TABLE 4.1 Theoretical Call Values as Time to Expiration Changes

Days to Expiration	Price	Price if It Were a Multiple of the 30-Day Option Price	Discount Compared to 30-Day Option
30	0.57		
60	1.02	1.14	0.12
90	1.39	1.71	0.32
120	1.71	2.28	0.57
360	3.53	6.84	3.31

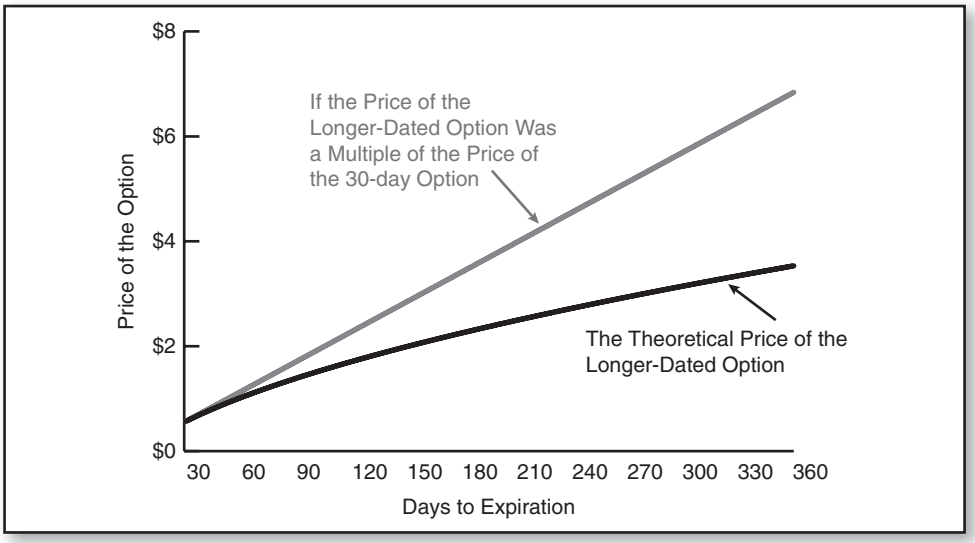


FIGURE 4.6 One Long-Dated Covered Call or a Series of 30-Day Covered Calls?

Let's connect the dots again and see just how the discount increases with time, even though our 30-day, 60 strike JPM covered call is out-of-the-money such that it erodes in a straight line. We can see this in Figure 4.6.

It's obvious from this that you're better off selling a 30-day covered call, having it expire and selling another 30-day covered call, rather than selling a single 60-day covered call. In this example, you'd be 0.12 ahead by selling the series of 30-day covered calls and since we'd collect a total of only 1.14 (0.57 × 2), assuming the underlying didn't move and nothing changes (admittedly, a pretty outlandish assumption but necessary for our purposes), giving up 0.12 of that 1.14 would mean giving up just over 10 percent of the total premium we might collect.

If we took this to the logical extreme and were able to sell a series of 30-day options at 0.57, we would collect a total of 6.84 (0.57 × 12) over a 360-day "year." And the value of that hypothetical 360-day call? It's 3.53, or a 3.31 discount to what we'd collect from selling a series of covered calls. Again, you can see this in Figure 4.6. The simple takeaway? You're better off selling shorter-dated options.

Profitability

How profitable is our JPM covered call trade? If JPM is below 60.00 at option expiration, we'll pocket that 0.57 so we'll be 0.57 better off no matter how far below 60.00 JPM is. With JPM at 58.50 right now, that 0.57 would be a yield of very close to 1 percent (0.57/58.50) for those 30 days. Annualized, that's 12.68 percent with compounding, as you can see in Table 4.2. That's pretty good for selling an option that has

TABLE 4.2 Yield from Our Covered Call

Option Premium Yield	
Current stock price	58.50
Covered call premium received	0.57
Option premium yield	0.97%
Annualized option premium yield	12.34%

only a 33 percent likelihood of being in-the-money at expiration (this 33 percent likelihood is the delta of the 60 strike covered call as calculated at www.OptionMath.com).

But what would our percentage return be if the option is in-the-money at expiration and our stock gets called away? Our effective selling price would be the strike price, 60 in this case, plus the option premium received, 0.57 in this case, so our effective selling price would be 60.57. You'll note that our effective selling price is equal to our regret point. This will always be the case.

With JPM at 58.50 now that would be a $2.07 profit which is 3.5 percent (2.07/58.50) for the 30-day term of our trade or over 51 percent annualized, as is shown in Table 4.3.

Covered Calls and Downside Protection—Not As Much As We'd Like

We discussed our results if JPM rallies, but the 0.57 in option premium that we collect also provides a little protection against JPM falling in price. Too often, stockholders sell covered calls to generate premium exclusively for this downside protection. That really shouldn't be the rationale for selling covered calls because the amount of downside protection generated is usually pretty small and, second, if you thought you needed downside protection, then there is probably a better strategy than selling a covered call. Simply selling your stock would be one such strategy. A little downside protection is just a happy secondary benefit to selling a covered call. And just how much downside protection is generated from our JPM covered call? The stock is currently at 58.50. We collected 0.57 for selling the call,

TABLE 4.3 Yield if Called Away

Return if Called Away (Because Stock Is Above Strike Price at Expiration)	
Current stock price	58.50
Effect selling price (strike plus option premium collected)	60.57
Return if called away	3.54%
Annualized return if called away	51.78%

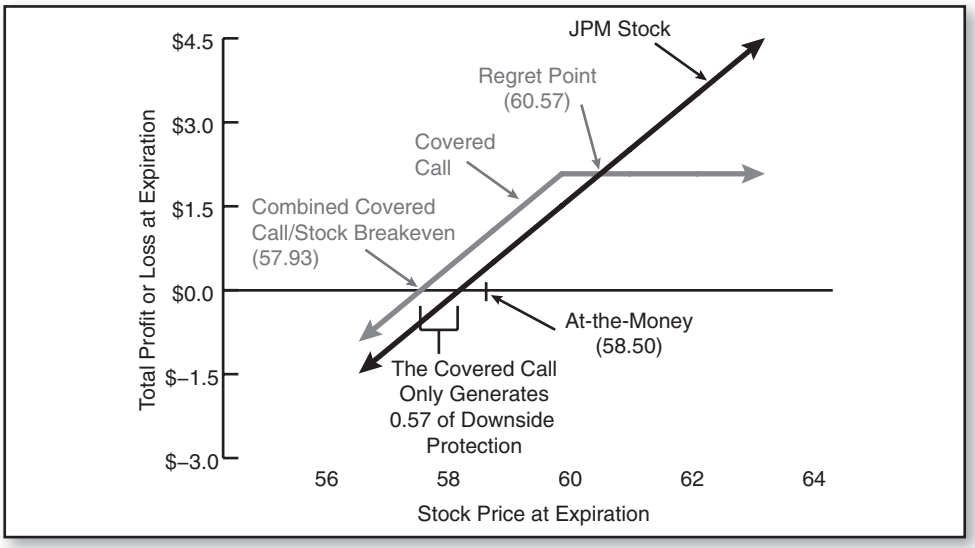


FIGURE 4.7 Downside Protection from a Covered Call—Not as Much as We'd Like

which means that our downside breakeven for the combination trade is 57.93 (the current price of 58.50 minus the premium received of 0.57), which is 0.97 percent worth of downside protection. But if JPM falls, then it doesn't matter how far it falls, we're 0.57 better off for having sold the covered call. You can see this protection in Figure 4.7.

Using Covered Calls to "Create" Dividends

Covered calls can be used to "create" dividends for non-dividend-paying stocks and the strategy usually works well because non-dividend-paying stocks tend to have higher implied volatilities meaning the covered call you'll sell is going to be fairly expensive. Why are options on non-dividend-paying stocks more expensive? Because a dividend tends to buffer changes in the price of a stock and those changes in the price is volatility.

One non-dividend-paying stock that many investors would like to own—if it paid a dividend—is GLD, the gold exchange-traded fund (ETF). If an investor needs their portfolio to generate some income in the form of dividends, then non-dividend-paying GLD isn't a candidate for their holdings.

Selling a covered call on GLD is similar to having GLD pay a dividend. It truncates a little of the potential appreciation, since the company, or ETF in this case, doesn't have that cash to put to work or to hold gold with.

Let's look at some covered calls we might sell with GLD trading at 131.75 and we'll include the option price, the time to expiration, the implied volatility, and the amount

TABLE 4.4 Potential Covered Calls in GLD

Strike Price	Days to Expiration	Option Price	Implied Volatility	Today's Expected Erosion (Theta)	Annualized Yield	Likelihood of Having GLD Called Away
131	30	3.35	19.31%	–0.0442	26.43%	56%
132	30	2.81	19.11%	–0.0445	29.27%	50%
133	30	2.34	18.99%	–0.0438	23.89%	44%
134	30	1.93	18.92%	–0.0421	19.36%	38%
135	30	1.58	18.90%	–0.0396	15.38%	32%
140	30	0.56	19.61%	–0.0211	5.30%	11%
145	30	0.21	21.14%	–0.0068	1.93%	3%
150	30	0.09	23.06%	–0.0014	0.83%	0.4%
175	30	0.01	34.75%	–0.0000	0.09%	< 0.1%
131	58	4.40	18.70%	–0.0323	18.76%	56%
132	58	3.88	18.62%	–0.0325	20.04%	51%
133	58	3.40	18.54%	–0.0322	17.39%	47%
134	58	2.98	18.54%	–0.0316	15.11%	42%
135	58	2.59	18.51%	–0.0307	13.03%	38%
140	58	1.24	18.76%	–0.0223	6.07%	20%
145	58	0.59	19.53%	–0.0126	2.85%	9%
150	58	0.31	20.84%	–0.0056	1.49%	3%
175	58	0.03	27.90%	–0.0000	0.14%	< 0.1%
131	121	6.15	18.39%	–0.0229	12.88%	56%
132	121	5.65	18.38%	–0.0230	13.50%	53%
133	121	5.15	18.28%	–0.0229	12.26%	49%
134	121	4.70	18.25%	–0.0228	11.15%	46%
135	121	4.28	18.22%	–0.0225	10.12%	43%
140	121	2.62	18.26%	–0.0194	6.12%	30%
145	121	1.59	18.63%	–0.0149	3.68%	19%
150	121	0.98	19.23%	–0.0102	2.26%	11%
175	121	0.16	23.92%	–0.0004	0.37%	0.2%

of erosion expected today (theta) to help us make our decision. We can see these in Table 4.4. The implied volatility and theta were calculated at www.OptionMath.com.

Wow, that's a bunch of options. Let's try to focus our alternatives a little bit. Even though the 121-day options offer the highest call price, the annualized yield is lower than for the 30-day options with the same strike price. The same is true for the 58-day calls. This is a function of the way options expire as we saw previously and in Chapter 2, so let's limit our candidates to the 30-day options.

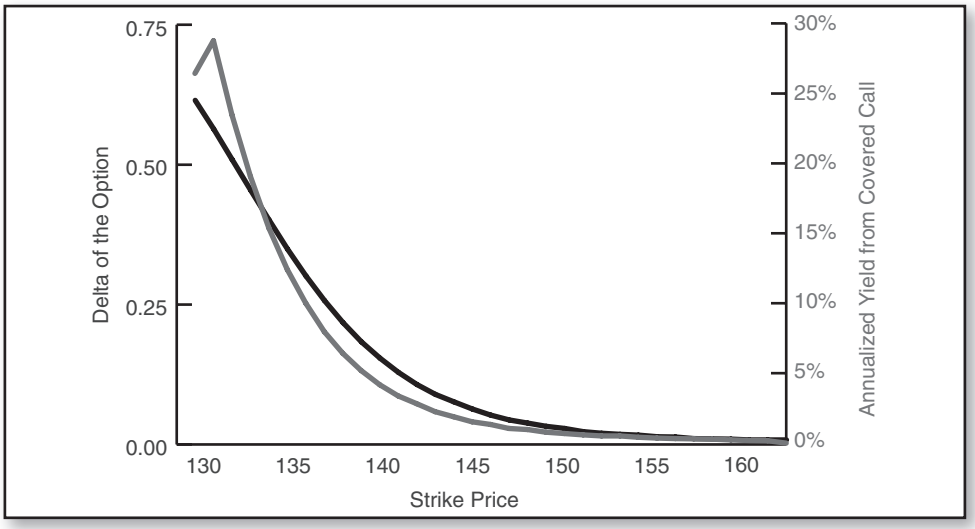


FIGURE 4.8 Covered Call Yield and Likelihood of Getting Stock Called Away

Among the 30-day options, there's a range of likelihoods that we'll see our GLD shares called away. Let's connect the dots and see the likelihood of having our GLD shares called away for each of those strike prices along with the annualized yield for each of those strike prices. You can see that in Figure 4.8.

You'll notice that the relationship is pretty stable, the higher the likelihood of getting our stock called away, the higher the yield generated but in the very upper left of the chart the annualized yield starts to fall. That's because the time value of the option has started to fall as those calls start to get further in-the-money. Only the time value will erode away and generate yield. Inherent value isn't really yield because it is just the reduction in price we'll see for our GLD shares when we sell them at the strike price.

Let's take a look at all the 30-day options and examine their time value. We can see this in Figure 4.9.

The time value peaks when the option is at-the-money or closest to at-the-money as with the 132 strike (the underlying ETF, GLD, was at 131.75, so the 132 strike was closest to at-the-money) for our GLD options. It's no accident that this option has the highest annualized yield of all those GLD options we looked at initially. But it also has a relatively high likelihood of getting our stock called away with a delta of 50, and that's not our goal. So how do we balance yield with the goal of having the option erode away and expire worthless? That's the art of option trading.

You've seen that the relationship between yield and the odds of getting our stock or exchange traded fund called away is pretty stable. Using the delta which you can calculate at www.OptionMath.com pick the strike that you feel comfortable selling, and that is the best balance of yield and getting called away. One way to do this

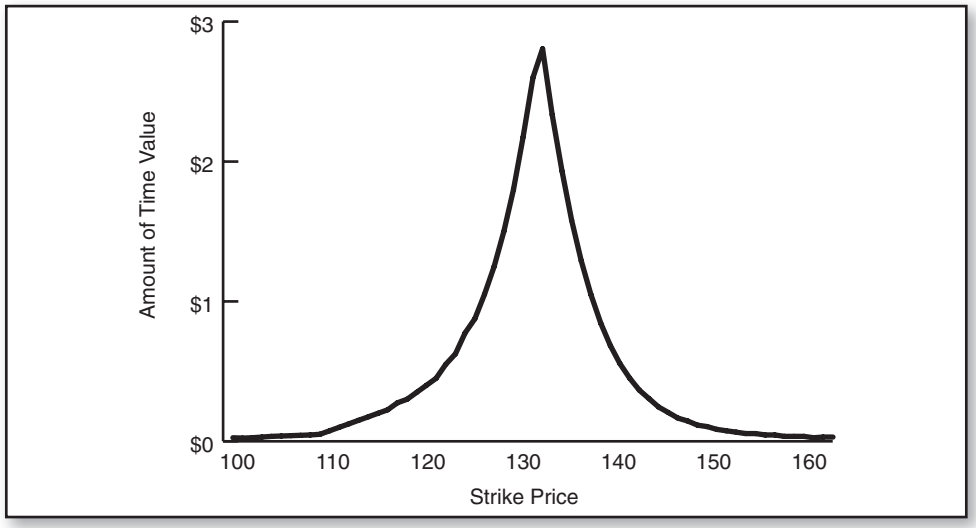


FIGURE 4.9 Covered Call Time Value for Several Strike Prices

analysis is to look at the chart for each combined position. Figure 4.10 shows the payoff chart for a covered call that is slightly in-the-money, the 131 strike in this case, slightly out-of-the-money with a likelihood of getting called away of about 33 percent, the 135 strike in this case, and deeply out-of-the-money with a likelihood of getting called away of only 3 percent, the 145 strike in our case.

The 145 strike covered call is barely distinguishable from the naked ETF. The 0.21 in premium collected is only a tiny fraction of the underlying ETF value, so

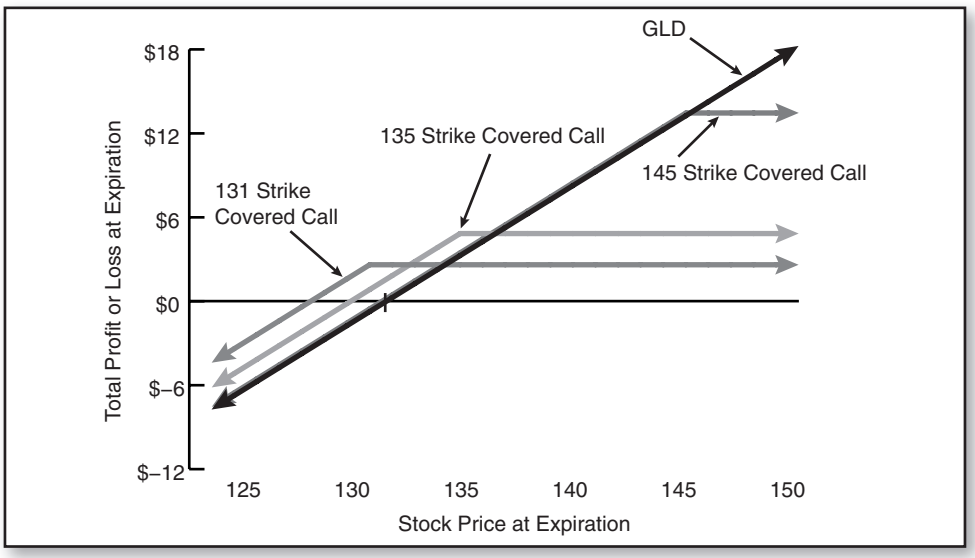


FIGURE 4.10 Three Potential GLD Covered Calls

TABLE 4.5 Breakeven Point, Regret Point, and Yields for Our Covered Calls

Option Premium Yield	131 Strike	135 Strike	145 Strike
Current stock price	131.75	131.75	131.75
Covered call time value received	2.60	1.58	0.21
Breakeven Point	129.15	130.17	131.54
Regret Point	133.60	136.58	145.21
Option premium yield	1.97%	1.20%	0.16%
Annualized option premium yield	26.43%	15.38%	1.93%

the combined position will act very much like the naked stock. The 131 strike covered call has a delta of 56, so the odds are very good that you'll end up with 134.35 instead of your shares of GLD when these options expire, so this position can't be expected to act much like GLD. The 135 strike covered call has a delta of 32, so this is truly a hybrid position; it collects 1.58 in time value and doesn't stop appreciating until GLD rallies from 131.75 to 135.00. Let's take a look at the breakeven points, regret points, and yields for all three covered calls. You can see these in Table 4.5.

Now let's look at the returns and yields if called away. We see these in Table 4.6.

It's easy to look at Table 4.5, the one that describes the option's yield, and think the 131 strike, the in-the-money strike that generates an annualized yield of over 26 percent, is the covered call to sell. But that would mean a better than even chance of getting your shares of GLD called away. It's easy to look at Table 4.6, the one that describes the return if called away, and think the 145 strike, the deeply out-of-the-money strike that generates an annualized return of over 221 percent, is the covered call to sell. But the odds of realizing that return by having your shares called away at 145 are very remote. The delta tells us the likelihood is only about 3 percent. And if our shares aren't called away the 145 strike generates an annualized yield of less than 2 percent.

Ultimately, the selection of the strike price will depend on your outlook for GLD for the term of the options and your stomach for having your shares called away but in-the-money and deeply out-of-the-money calls are rarely the best choice for your covered call.

TABLE 4.6 Returns and Yields if Called Away

Return if Called Away	131 Strike	135 Strike	145 Strike
Current stock price	131.75	131.75	131.75
Effective selling price (strike plus option premium collected)	133.60	136.58	145.21
Return if called away	1.40%	3.67%	10.22%
Annualized return if called away	18.21%	54.04%	221.33%

Having Your Shares Called Away

Getting an assignment notice demanding that you sell your shares to the owner of the covered call you've sold might seem daunting, but it's not to be feared. We've seen that for many covered calls it's to be expected that we'll eventually have our stock called away.

The only time to fear having stock called away is if you enjoy a substantial unrealized profit in the shares. In that case, having your stock called away will result in recognizing that substantial profit and having to pay tax on it. If the prospect of paying tax on that profit is so terrifying, then you shouldn't be selling covered calls on that stock. Pick another stock in your portfolio for selling covered calls.

These three potential covered calls in GLD, the 131 strike, 135 strike, and 145 strike, have very different return profiles depending on what GLD does during their term. The 145 strike needs GLD to rally in order to achieve its maximum return if called away. This would be a trade for someone who was very bullish GLD. The 131 strike does best if GLD falls slightly if your goal is to keep your GLD shares, so this covered call is actually best for someone who's slightly bearish GLD. The 135 strike is the strike for nearly any outlook for GLD, a little bullish, a little bearish, or sideways.

In fact, having your shares called away may mean that you realize an effective price (strike price plus option premium received) that is higher than the stock has ever traded. In that case having your stock called away may be exactly what you were trying to accomplish. If you think your stock has more room to the upside, then you can always buy your call option back before you are assigned to sell your shares. How will you know that you are likely to be assigned?

The academic literature is certain about one thing: theoretically, there's only one reason the owner of the call option you are short might exercise his option prior to expiration. And that one reason? A looming dividend. Only owners of the stock get paid the dividend. No matter how far a call is in-the-money, the owner of the call won't receive the dividend, and in fact, since the price of the stock will drop by the amount of the dividend on the day the stock goes ex-dividend, the call owner will actually lose money when his call drops in value along with the stock on the ex-dividend date. So someone holding a long call with no time value has nothing to lose and the dividend to gain by exercising his call early, taking ownership of the stock before the ex-dividend date, and receiving the dividend. This means that if a covered call is in-the-money, a dividend is looming, and the call has less time value than the value of the dividend, then it's likely that the call will be exercised and as a covered call seller we'll be required to deliver our stock and we'll miss out on the dividend.

Other than a looming dividend, there's no reason to exercise a call option early, so for the covered call seller it's pretty easy to figure out when your call will be

exercised and you'll be required to deliver your stock. If there's no dividend on the calendar, then your in-the-money covered call will be exercised only on the last day or two of its term. If there is a dividend and the time value remaining in your covered call is less than the dividend to be paid, then expect to have the call exercised by the owner early enough that he will take ownership of the stock before the day the stock goes ex-dividend.

There is also a small population of option traders that will early exercise a put option if in doing the math they realize that the interest earned on the cash they will receive for selling or shorting the stock via put option exercise is greater than the time value of the put option. This is rare—much rarer than early exercise of a call to capture a dividend.

Don't Fear Assignment

Having your covered call assigned and having to sell the underlying stock at the strike price doesn't mean you've done something wrong, and if you were hoping to have your stock called away as a means of exiting a long position in the stock, then congratulations—your trade worked well. If your effective selling price (the strike price plus the option premium received) is higher than the stock has actually traded at, then you're due a double dose of congratulations—your covered call worked perfectly.

Assignment of short option positions is at least partly random for all options cleared through the Options Clearing Corporation (OCC), which is every equity, index, and ETF option traded in the United States. Options on futures, including index futures like S&P 500 futures, are generally cleared through the relevant futures exchange but similar rules apply. The OCC randomly allots assignments to brokerage firms that have short positions in the particular option that has been exercised. The brokerage firm then allots the assignment notices to the short option positions its customers have using a fair assignment method. This fair assignment method might not be random. It might instead be "first-in, first-out." Your broker can tell you which they use, but it doesn't really matter. Your trading strategy shouldn't hinge on avoiding an assignment that you know is coming.

Your broker will handle all of the assignment transaction. In the case of your covered call, your broker will deliver your shares to the call exerciser, removing the shares from your account, and will deposit the cash received for the shares in your account. For your purposes, assignment is exactly like selling your stock. Think of it as being similar to a limit order to sell your stock that you had in the market for some time. Assignment is like having your sell order filled—you no longer own the stock; it may be trading much higher than where you sold it, but you have received cash. It's now time to execute your next option strategy.

Stock Covered Vertical Call Spread

A covered call sacrifices all the potential appreciation above the strike price of the call in exchange for the premium collected today. That's usually a good trade since, as we've discussed, over time, the value received in the form of call premium is greater than the value given up in the form of potential appreciation. But what if you didn't want to give up all the potential appreciation?

You shouldn't be selling covered calls on stocks you believe will appreciate strongly, but what if there's a potential catalyst that might propel the stock substantially higher or if you think there's a small but reasonable chance that the stock is a takeover candidate but you believe the likelihood is overwhelming that the stock will move sideways despite a generally positive long-term outlook? Then you might want an option structure that generates premium but which resumes participating in a rally if the stock rallies enough. That would be a stock covered vertical call spread.

In a stock covered vertical call spread you're long the underlying stock and sell a vertical call spread against it. The ownership of the underlying stock "covers" that portion of the risk of the call spread that exceeds the premium received for selling it.

A stock covered vertical spread is the first structure we'll discuss that replaces an option, in this case the covered call option, with a vertical spread, in this case a call vertical spread. We can also do this with a call spread in the risk reversal we discuss in Chapter 10 and we can replace the put option in a collar with a vertical put spread. We discuss collars including put spread collars in Chapter 9.

Let's return to our GLD example and see how selling a stock covered vertical call spread rather than an outright covered call changes the trade. Figure 4.11 shows some of the calls available in GLD and how we might construct a stock covered vertical call spread.

We initially saw these options in Table 4.4. Instead of selling the 135 covered call for 1.58 and having a regret point of 136.58, we can sell the 134/140 vertical call

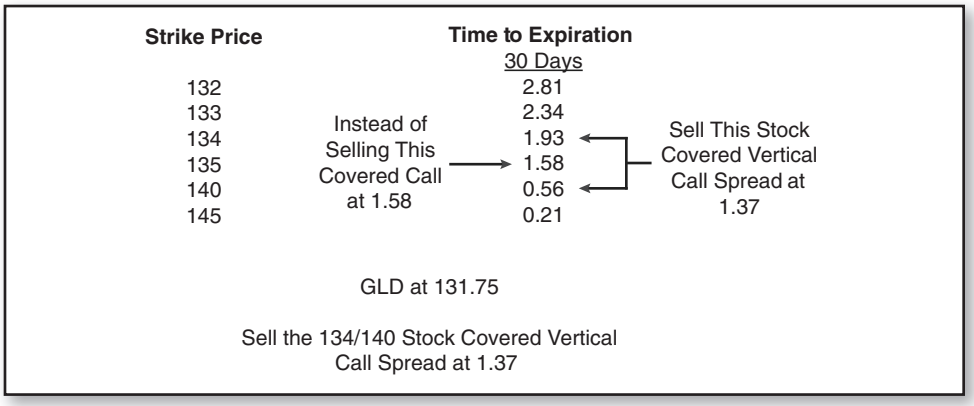


FIGURE 4.11 A Stock Covered Vertical Call Spread in GLD

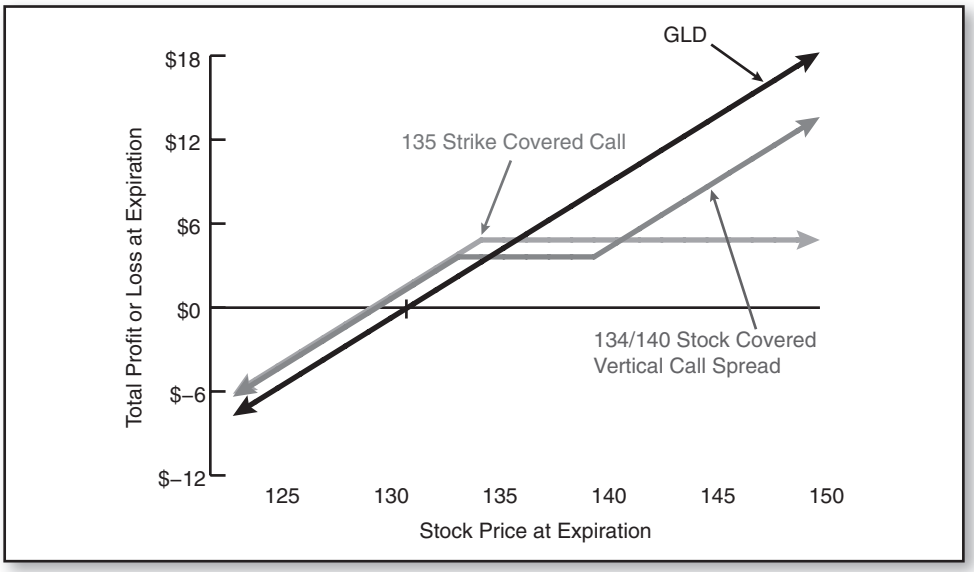


FIGURE 4.12 A Stock Covered Vertical Call Spread versus a Traditional Covered Call

spread and create a hybrid position that will resume participating in the rally if GLD is above the 140.00 level before expiration. The payoff profile for this stock covered vertical call spread can be seen in Figure 4.12.

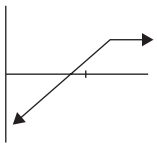
Once GLD gets above the strike price of the long call portion of the vertical spread, the 140 strike in this case, the total position starts to participate again. Above this level the hybrid position will always lag an outright long position in GLD but by how much? It will lag by the loss on the vertical spread or 4.63 (the 6.00 width of the spread minus the 1.37 collected for selling the spread) in this case. But above a certain level the stock covered vertical spread will outperform the traditional covered call. That level is the upper strike of the spread, 140 in this case, plus the additional amount of premium collected for selling the traditional covered call, 0.21 in this case (1.58 – 1.37), or 140.21. Above here, the stock covered vertical call spread will outperform the traditional covered call. Below the upper strike price, the traditional covered call will outperform the covered spread by the additional premium collected.

How does using a stock covered vertical call spread change the likelihood of having our GLD called away? Our traditional covered call had a 32 percent likelihood of seeing our GLD called away. The 134 strike call that we're short in our stock covered vertical call spread has a delta of 38 meaning it has a 38 percent likelihood of seeing our GLD called away but we're also long the 140 strike call and if GLD is above 140.00 at option expiration we'll be able to call our GLD shares back. The delta of the 140 strike call is 11 meaning the likelihood of GLD being above 140.00 is 11 percent. The net likelihood of having our GLD called away is 27 percent

(38 – 11). The net likelihood of our call spread having our shares called away is slightly lower than the likelihood of our traditional covered call having our shares called away and if GLD rallies enough our stock covered vertical call spread starts participating again. The price we pay for this lower likelihood of getting called away and ability to participate in a rally above 140.00 is that we collect 0.21 less for selling the call spread than we collect for selling the traditional call. Also, the call spread will see our GLD called away if GLD is above 134.00 but below 140.00 at expiration, while the traditional covered call doesn't see our GLD called away until it's above 135.00 at expiration.

Between 134.00 and 135.00, we're not only susceptible to having our GLD called away when we wouldn't otherwise, but we also receive less in total option premium.

Covered Call Cheat Sheet

	Covered Call
Description	Long underlying stock, short call
Example	ATM = 100 Long 100 shares of stock Short one 105 strike call
Pay or Collect Premium	Collect
Needed Directionality	
Passage of Time without Market Movement	+ + +
Increase In Implied Volatility without Market Movement	– – –
Payoff Thumbnail Chart	
Maximum Risk	Price of the stock when the covered call is sold minus premium received (if stock drops to zero)
Maximum Profit	Regret point (call strike price plus premium received) minus price of the stock when the covered call is sold
Breakeven Points	Stock price when the covered call is sold minus premium received

CHAPTER 5

Covered Puts

The seller of a put option agrees, in exchange for the premium received, to buy the underlying stock at the exercise price if the owner of the put chooses to exercise his option.

Selling a naked put, that is, a put that isn't covered by either another put option, a short position in the underlying stock or enough segregated cash to buy the stock at the strike price, is a little like getting paid to serve as a target. Usually, the market will miss the target, sometimes the minimal damage done is more than made up for by the premium received. Sometimes the impact will really hurt. The maximum potential loss from a naked put is substantial and is many times the investment, in the form of margin posted to cover the potential loss.

However, if the put option seller were to segregate the cash necessary to satisfy his duty to buy the underlying stock at the exercise price, then he'd be certain to be able to satisfy that duty as opposed to the naked put seller, who may or may not be able to fully satisfy the duty to the owner of the option.

A covered put is a combination of a short put and cash. The amount of cash is the sum necessary to buy the underlying stock at the strike price. Because the put is covered by cash it is sometimes called a cash-secured put. Covering the put by segregating the cash necessary to buy the stock, if required, doesn't reduce the risk of the trade, the stock can still drop to zero, it just makes certain the put seller can satisfy his duty.

A covered put is a trade that generates a defined maximum profit, the put premium received, while carrying risk equal to the strike price of the option minus the premium received. The risk will certainly be many times greater than the potential profit, but the risk is no greater than, and almost certainly less than, the risk from buying the stock outright and the likelihood of realizing a profit is generally much greater than the likelihood of realizing a loss.

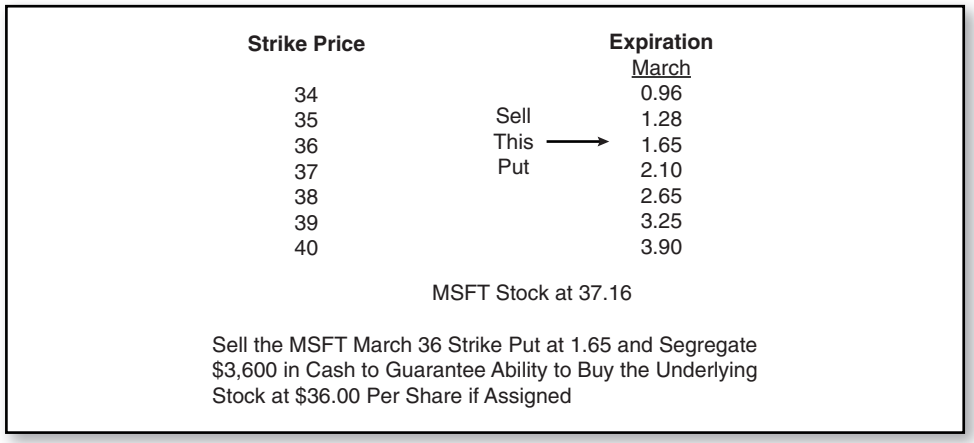


FIGURE 5.1 A Covered Put in MSFT

A cash-secured put is a great tool for investors as well as traders and has a payoff profile that's very different than that of short puts covered by ownership of another put (this is one of the forms of a vertical put spread discussed in Chapter 3) or by a short position in the underlying stock. Traders can sell a covered put confident that they can satisfy their obligation while speculating that implied volatility will fall or that the underlying stock will be sideways, higher, or only slightly lower at expiration. Investors can sell a covered put as a way to potentially buy the underlying stock at a discount, that is, at an effective price that is lower than the price that is available today for the stock while getting paid, in the form of the option premium received, for the risk taken. This option premium means that the seller of a covered put may end up buying the stock at an effective purchase price lower than is ever seen in the market. You can see a covered put in Microsoft (MSFT) in Figure 5.1.

The segregated cash of $3,600.00 can include the $165.00 received for selling the put, but with that amount of cash we can be certain that we'll be able to satisfy our duty to the put buyer to take possession of the stock and pay her $3,600.00 if she chooses to exercise.

What's the maximum profit from selling a covered put? As with most short option or option spread positions, it's the premium received. In this case, it's 1.65 (a total of $165.00). And the maximum loss? Segregating the cash doesn't reduce the risk from the trade; it simply makes certain that we can pay for the stock if necessary. That means the stock can still drop to zero and the loss from the trade would be 34.35 (36.00 – 1.65) per share.

If covering the put doesn't reduce the risk but ties up so much money, then why cover it? Consider a covered put to be like a limit order to buy the stock, but a limit order that pays us in the form of option premium received while we wait to see if our order gets

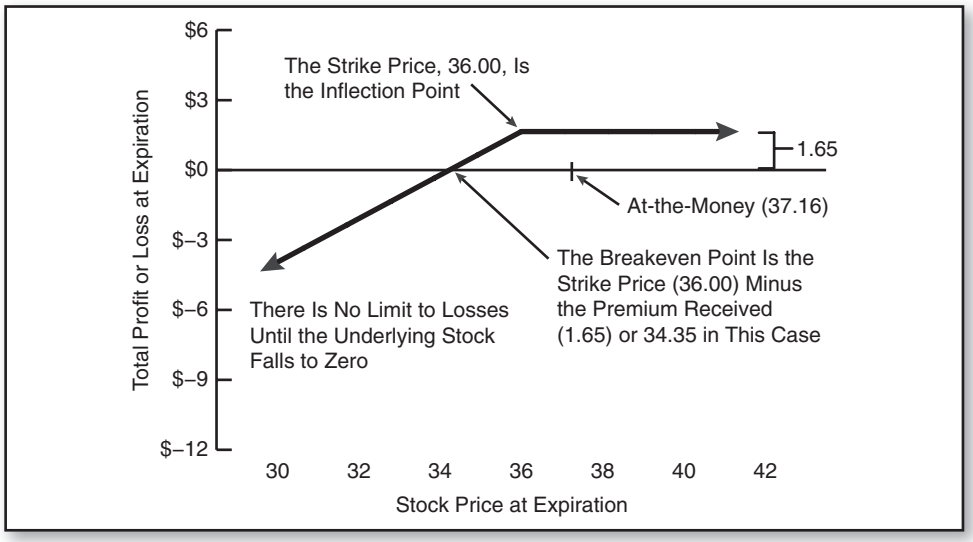


FIGURE 5.2 MSFT Covered Put Payoff Chart

filled. If you placed a limit order to buy, you'd have the cash in the account to pay for it, wouldn't you? Most brokers will require you to leave substantial margin in order to short puts, but that margin usually won't come close to actually paying for the stock. To make certain we can pay for the stock if necessary, we'll cover the put with cash.

The payoff chart for our cash-secured MSFT put can be seen in Figure 5.2.

The strike price of the put is the inflection point, the point at which the profit starts to fall. Below this inflection point, the profit is less than the premium received, and eventually the profit becomes a loss once the underlying stock drops below the breakeven point.

Below the inflection point—the strike price of the covered put we've sold—the payoff chart is shaped just like ownership of the stock because below the strike price, the put seller will eventually own the stock; it will be put to him by the owner of the put. For our MSFT covered put, this strike price and inflection point was 36.00. Let's look at our covered put versus ownership of the underlying MSFT stock (Figure 5.3).

You'll notice that as long as MSFT is below the strike of the option, the covered put will outperform the stock by the option premium received plus the amount by which the put option was out-of-the-money when it was executed.

The breakeven point is the point at which the loss from being put the stock at the strike price is precisely equal to the premium received. Thus, the breakeven point is the strike price minus the premium received, and for our MSFT covered put, this was 34.35 (36.00 – 1.65).

Since we're selling time value, and since we'll collect it slowly, this covered put will generate its profit over time. Since we know options erode more slowly with more time to expiration, we wouldn't expect to make as much money in the first

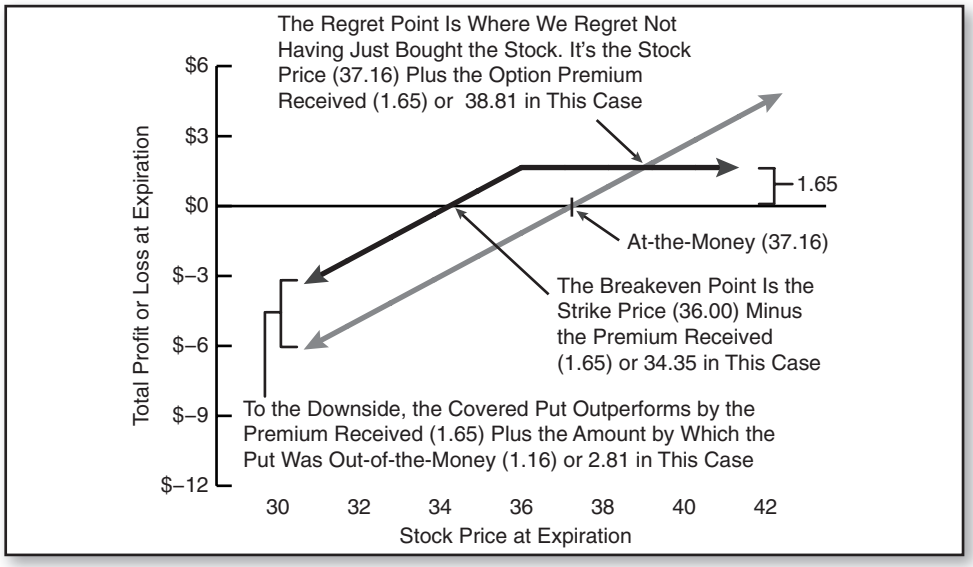


FIGURE 5.3 MSFT 36 Strike Covered Put versus MSFT Stock

15 days as we'd expect to make in the last 15 days. But if we had to close the trade prior to expiration by buying back our covered put, this payoff over time is going to be important to us. Let's look at Figure 5.4, which shows how the price of this covered put will change over time for a range of underlying stock prices.

The amount of cash required to cover a short put is simply the amount required to buy the underlying stock at the exercise price. This means that we have

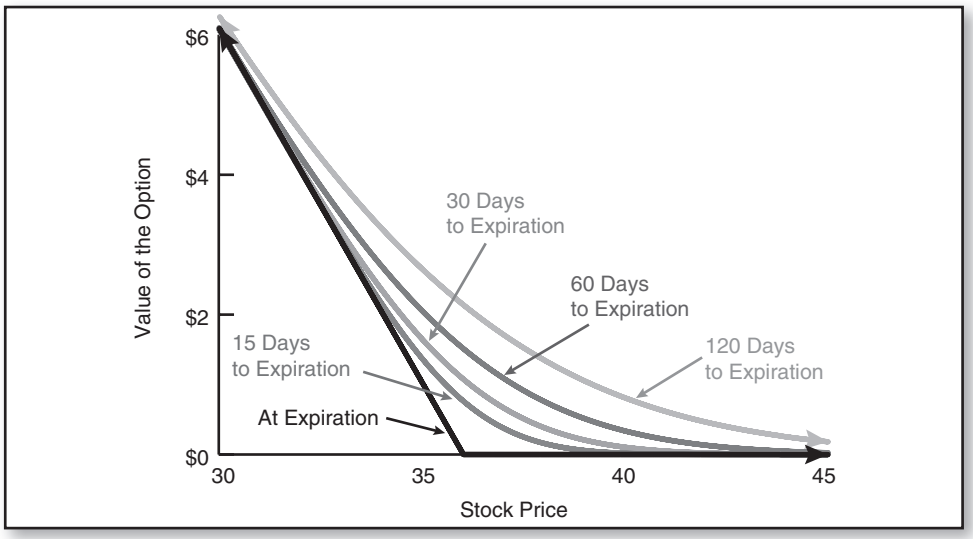


FIGURE 5.4 MSFT 36 Strike Covered Put by Time to Expiration

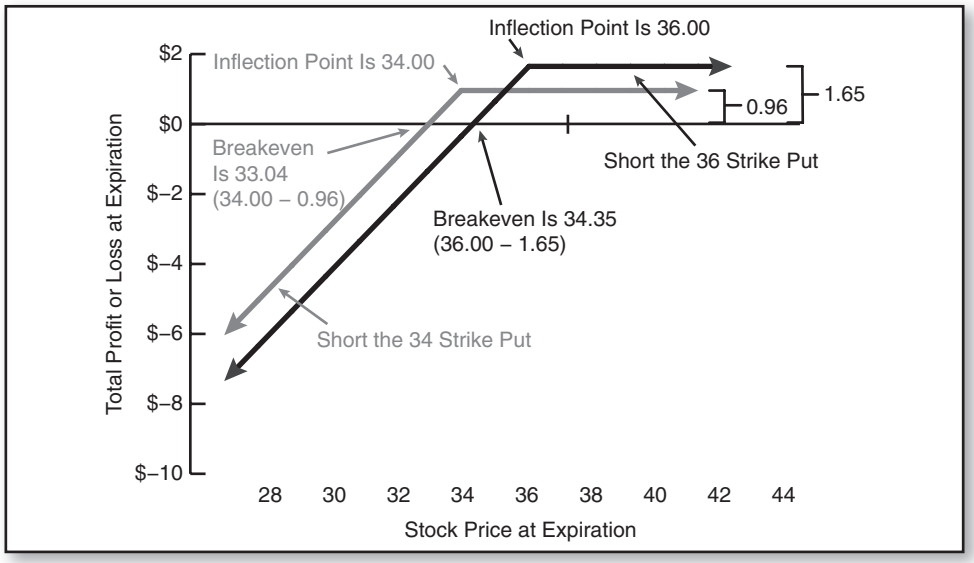


FIGURE 5.5 36 Strike versus 34 Strike

to segregate less cash if we sell a put with a lower strike price. In our MSFT example, we segregated a total of $3,600 ($165 of the $3,600 came from the premium generated by the sale of the put) because we sold 1 of the 36 strike puts. We'd only have to segregate $3,400 if we'd sold 1 of the 34 strike puts. Unfortunately, looking at Figure 5.1, we'd only collect 0.96 if we sold the 34 strike put rather than the 1.65 received for selling the 36 strike put. However, our maximum potential loss would be only 33.04 (34.00 – 0.96) if we sold that 34 strike put. Figure 5.5 shows the payoff chart for selling the 34 strike put, along with the original payoff chart for selling the 36 strike put.

The shape of any of these cash-secured put payoff charts is identical to the shape of the payoff chart for any short put. Segregating the cash doesn't change the shape of the payoff chart but that doesn't mean it won't affect the trade. How so? Imagine that you'd sold a naked put, the underlying stock had dropped substantially, and you didn't have the cash or margin to buy the stock to satisfy the duty to the put option owner. You have so little room for error now that you'd likely be forced to buy back your short put at the worst possible time, when the stock is on its low and the put option is trading at its highest implied volatility (i.e., highest time value). Compare this to the flexibility that comes from selling a cash-secured put. Successful trading isn't just about avoiding mistakes; it's about avoiding situations where the mistakes you might make are both expensive and more likely to occur.

The Regret Point

Since the goal of a covered put is to either pocket the premium received or to buy the stock at a discount to its current price by getting paid while waiting to see if we get our buy order filled, is there a situation when that waiting is a mistake? Is there an outcome where simply buying the stock would have been better than trying to pocket the premium? Since the profit from a short put is capped at the premium received, the answer is yes. If the stock rallies, then it's possible that the profit foregone from not buying the stock is greater than the premium received and kept. The point at which the profit from simply buying the stock is equal to the premium that would be received is the regret point. Above this level, the put seller will regret not simply buying the stock because the profit missed from not buying the stock is greater than the premium received.

Careful readers will recognize the term *regret point* from our discussion of selling a covered call in Chapter 4. That's because selling a covered call, particularly if buying the stock and selling the call at the same time, is very similar to selling a cash covered put. We'll discuss this similarity later in this chapter.

Market Outlook

The appropriate market outlook for a covered put is generally slightly bullish, slightly bearish, or neutral. In any of those outcomes, the covered put seller will keep the entirety of the premium received, and, in general, few strategies would have been superior. Usually, if a trader were very bullish, they would execute a different strategy, since a covered put can only make the original premium collected no matter how high the underlying stock goes. If a trader is very bearish, then he might buy a put rather than selling a covered put, but selling a covered put will be profitable if the stock drops only slightly yet remains above the breakeven point. A covered put will realize its maximum potential profit, the full amount of the premium received, if the underlying stock does anything, including dropping, but is above the strike price at the time of option expiration. If a trader believes the underlying stock will move sideways, that is will neither rally significantly nor drop significantly, then a covered put would be a very logical choice.

Notice that all three market outlooks that are appropriate for a covered put (up slightly, down slightly, or sideways) need the underlying stock to be rather docile or not volatile. That's because selling a covered put is a short volatility strategy, it does best with low realized volatility from the time the option is sold until expiration.

But it's possible to construct a covered put that can make money even if the stock drops substantially (by selling a deep out-of-the-money put), and it's possible to construct a covered put that makes money without reaching the regret point even if the stock rallies substantially (by selling an in-the-money put). In fact, by selling

an in-the-money put the market *has* to rally in order for the position to achieve its maximum profit. Let's look at all three strategies because they're different and assume different market outlooks.

Out-of-the-Money Covered Puts

The covered puts we've been discussing so far have generally been struck fairly close to at-the-money. That is, the strike price of the option has been fairly close to the current price of the stock. The first covered put we looked at, the MSFT covered put, was struck at 36 with the underlying stock at 37.15. This was not the first out-of-the-money put—that would have been the 37 strike put—but the 36 strike was fairly close to at-the-money. Normally, the strike price of the covered put will be slightly below the current stock price, as our MSFT put was, but even if it's slightly above the current stock price this trade does best, in absolute terms and relative to other strategies, when the underlying stock doesn't move very much. Again, this trade is short volatility, so we want realized volatility, the amount by which the stock moves, to be low.

What if we thought the stock would likely move sideways but that there was a small chance that it would drop substantially? What if the stock had earnings coming out soon or if it was a biotech company that had good long-term prospects but that would have results of an important clinical trial released in the near future? In either case, we might be willing to buy the stock at a really big discount if we could get paid option premium while waiting to see if we buy the stock. In this case we might sell a put that is substantially out-of-the-money. Since the option is struck substantially out-of-the-money, the amount of premium received will likely be very small. But the odds of being put the stock are low, and the effective purchase price if we are put the stock would be much lower than the current stock price.

Table 5.1 shows the puts with approximately 35 days to expiration for a volatile biotech stock that was trading at 17.45.

TABLE 5.1 Biotech Covered Puts and Likelihoods

Strike Price	Option Price	Breakeven Point	Move to Reach Breakeven	Likelihood of Move to Breakeven
11	0.15	10.85	38%	5%
12	0.20	11.80	32%	8%
13	0.35	12.65	28%	11%
14	0.55	13.45	23%	16%
15	0.85	14.15	19%	20%
16	1.30	14.70	16%	23%
17	1.70	15.30	12%	28%

The third column is the breakeven point for a seller of that put; note that each option has a different breakeven point. The fourth column is the percentage move that would be required to reach that breakeven point, but the fifth column is most interesting—it's the likelihood, measured by option delta, that the underlying stock will at least reach that breakeven point at option expiration. It's easy to think that you'd be happy to sell that 11 strike put at 0.15 because the stock could never drop 38 percent in such a short time, and you'd get to pocket the 0.15 as "free money." But the delta of the hypothetical 10.85 strike put is 5 percent meaning that the option market tells us that one time out of every 20, the stock will drop to or below that breakeven point at expiration. Remember, that 5 delta represents the likelihood that the underlying stock will drop to *at least* that level at expiration. It could go well below that level and if this stock drops at least 38 percent, then there's no telling how far below that breakeven point momentum and selling pressure will take it, meaning that losses sustained could be huge, even though the maximum potential profit was only 0.15. Again, professional option traders know that this sort of extreme move happens more frequently than predicted by a normal distribution of returns. Professional option traders also consider selling naked, that is, uncovered, deep out-of-the-money puts to be a great way to get rich slowly and go bankrupt suddenly. The covered put seller, however, knows that he'll be able to pay for the stock that's put to him, regardless of how far it drops below the strike price. Covering a deep out-of-the-money put doesn't change the math; it just means that the put seller knows how he's going to pay for the stock that's put to him.

Let's look at a more reasonable candidate for selling a covered put. What does the first out-of-the-money put, the 17 strike put, look like compared to that deep out-of-the-money put, the 11 strike? Figure 5.6 shows both payoff charts.

Selling a deep out-of-the-money put obviously provides a tremendous amount of room for error; that is, the stock can drop sharply and still not reach the point where the put is in-the-money, but it doesn't generate much premium either. In this case, the breakeven for the 11 strike put is 10.85, as selling the option generates only 0.15 of premium. And mark-to-market losses on the short put will likely be substantial. This isn't a huge concern for the covered put seller, but the covered put seller will see the impact on their trading account.

A final word about selling deep out-of-the-money puts. Since options started trading, even before there were options exchanges, some traders have sold deep out-of-the-money puts, sometimes called "teeny" puts, have done so uncovered, and have been happy to collect a "teeny" amount of premium because they think there's no chance that the market can drop far enough and fast enough to cause them a loss. They are wrong—often enormously wrong. When they're ultimately wrong, having sold these puts naked, then they've gone broke. Every professional option trader knows some option traders (that should be former option traders) who have

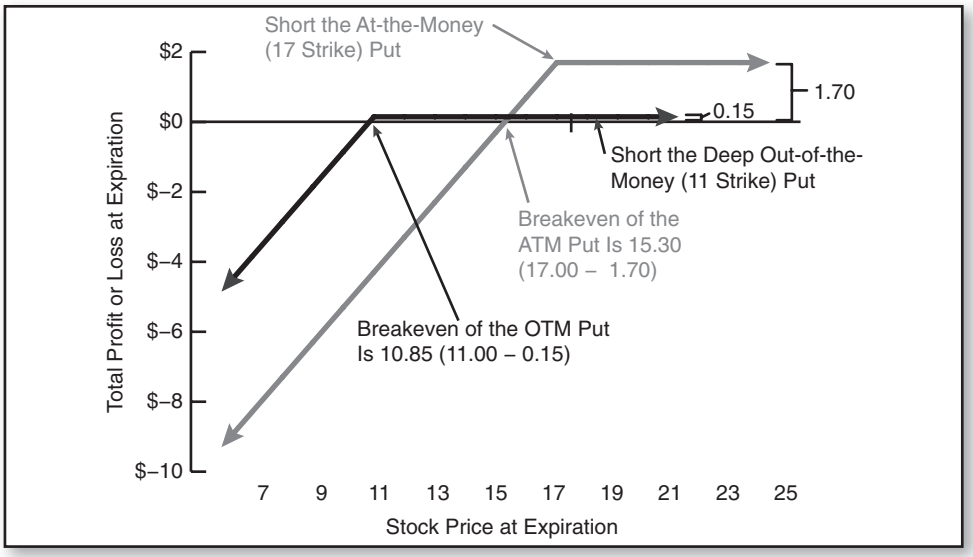


FIGURE 5.6 An At-the-Money Put versus a Deep Out-of-the-Money Put

regularly sold teeny puts and went broke doing it. Please don't. While the academic literature is full of studies showing that puts, particularly deep out-of-the-money puts, are, over time, more expensive than they should be, the academic literature is also full of studies pointing out that stocks can and do drop more and more frequently than would be explained by the normal distribution of returns. This is one reason deep out-of-the-money puts are so expensive. While you'll theoretically have the math on your side selling deep out-of-the-money puts, because over time they cost more than they're worth, you might well go broke before you can make a substantial amount of money. States make lots of money selling lottery tickets, but they take in lots of money first and then pay only a portion of it out. When you sell deep out-of-the-money puts, you're selling lottery tickets without taking in anything but that teeny bit of premium. And these extreme "tail risk" events will bankrupt the naked put seller.

In-the-Money Covered Puts

An in-the-money covered put needs the underlying stock to rally in order to achieve its maximum potential profit. As with any short put, the maximum profit for an in-the-money covered put will be realized with the underlying stock at or above the strike price at expiration so an in-the-money put seller is assuming the stock will rally to at least the strike price. Because of this, selling an in-the-money covered put, particularly one that is deep in-the-money, is very much like buying the underlying

TABLE 5.2 WFC Puts and Breakevens

Strike Price	Option Price	Breakeven Point	Move to Reach Breakeven	Likelihood of Move to Breakeven
43	1.75	41.25	5.37%	32%
44	2.25	41.75	4.22%	36%
45	2.80	42.20	3.19%	39%
46	3.50	42.50	2.50%	41%
47	4.25	42.75	1.93%	43%
48	5.10	42.90	1.58%	44%
49	5.90	43.10	1.12%	46%
50	6.85	43.15	1.01%	47%

stock with a cap on how much money can be made, since the total maximum profit from selling any put, including one that's in-the-money, is the total amount of premium received.

Table 5.2 shows a number of in-the-money puts for Wells Fargo & Company (WFC) when WFC was trading at 43.60.

The 43 strike put, the first out-of-the-money put, has a breakeven price of 41.25. What is the likelihood of WFC's dropping to 41.25? We know that likelihood is the delta of a hypothetical put struck at 41.25. Using the tools at www.OptionMath.com, we determine that likelihood is 32 percent. The likelihood of WFC being at or below 41.25 at expiration is 32 percent. Of course, that's not a measure of how far below 41.25 WFC could drop.

The 50 strike put, a put that's deep in-the-money, has a breakeven price of 43.15. If WFC is below 43.15 at expiration, then selling this covered put is going to lose money. Notice how much closer the breakeven of the 50 strike put (43.15) is to the current stock price (43.60) than is the breakeven of the 43 strike put (41.25). This is largely a function of the lower strike price, but it's also a function of that amount of time value in the option. The 50 strike put has only 0.45 of time value while the 43 strike put has 1.75 of time value. In fact, all of the price of the 43 strike put is time value.

Figure 5.7 shows the payoff chart of a 43 strike covered put compared to the 50 strike covered put. The 43 strike put is just out-of-the-money, a common strike selection, while the 50 strike covered put is substantially in-the-money, a much less likely choice.

Since an in-the-money covered put is so much like buying the underlying stock, it's susceptible to significant losses if the underlying stock drops just a little. The breakeven point for an in-the-money covered put is likely to be just a tiny bit below were the stock is currently trading as you saw in Table 5.2 and in Figure 5.7, where WFC stock was at 43.60 and the breakeven point of the 50 strike put was 43.15.

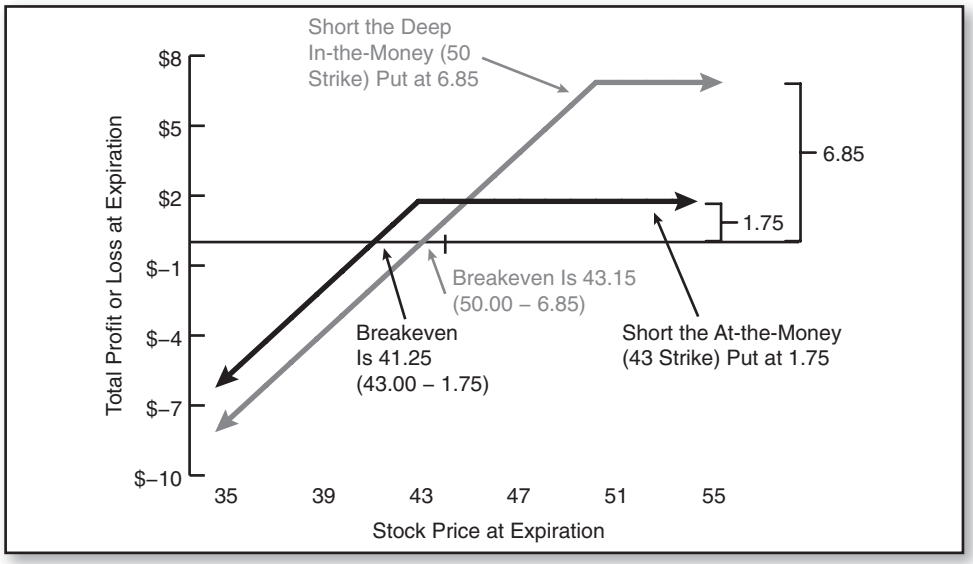


FIGURE 5.7 WFC Deep In-the-Money Covered Put versus At-the-Money Covered Put

The owner of the put is going to exercise the put if the stock price remains below the strike price and the seller of the covered put is going to be put the stock at that strike price.

It's important to remember that Table 5.2 shows the likelihood of WFC's dropping to or below the breakeven at expiration. That's not the same as the likelihood that WFC will be at or below the strike price of the option at expiration. The delta of the hypothetical 43.15 strike put is 47 meaning the odds of being at or below 43.15 at expiration is 47 percent. That 50 strike put has a delta of 89 meaning the odds of the put seller having to buy the stock at 50.00 are 89 percent. Of course, the effective purchase price is reduced from 50.00 by the option premium received. That 89 percent likelihood of eventually owning the stock is why selling a deep in-the-money put is so similar to an outright purchase of the stock.

The odds of being put the stock at 50.00 are 89 percent. While the effective purchase price is lower than 50.00 (it's the strike price minus the premium received or 43.15), this doesn't change the odds of being put the stock. This means the odds of buying WFC at an effective price of 43.15 are 89 percent. The other 11 percent are the odds that WFC is above 50.00 at option expiration, meaning the put owner won't exercise and we won't buy the stock, but we'll get to keep the 6.85 in premium received.

Figure 5.8 compares the payoff chart for this 50 strike put to an outright purchase of the stock.

Selling the deep in-the-money put results in a position that is very much like ownership of the stock, but it's not identical. The put seller gets to collect and keep the 0.45 of time value in the put, while the stock buyer doesn't have any limit on his

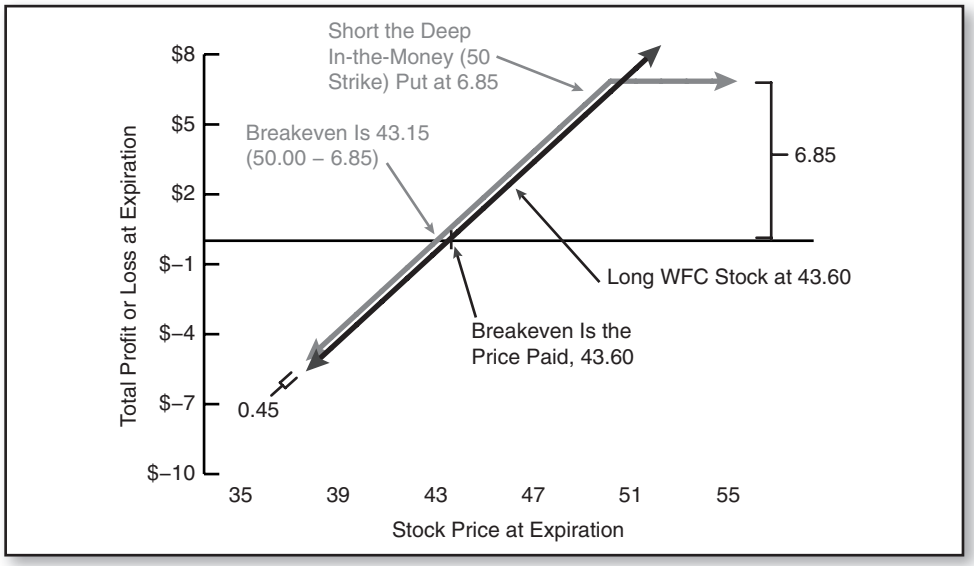


FIGURE 5.8 A WFC Deep In-the-Money Covered Put versus Owning the Stock

profit. The maximum profit for the put seller is the 6.85 collected regardless of how high WFC stock goes.

There's another hurdle for the seller of an in-the-money put, the bid/ask spread. The bid/ask spread for in-the-money options is generally wider than the bid/ask spread for at- and out-of-the-money options. For example, Figure 5.9 shows the bid/ask spread for a number of deep in-the-money put options on GM. If a trader wanted to get exposure to GM stock, he might think about selling one of these puts.

Even if a trader thought GM was due to rally sharply and didn't mind having a limit on his potential profit, would selling a deep in-the-money put be the best strategy? If this trader sold the March 55 strike put, he could sell it at the bid price of 14.85. He might offer his put for sale at another price including at a price somewhere in the

Strike Price	Expiration March Bid/Ask
45	5.70/5.80
50	10.05/10.20
55	14.85/15.05

GM Stock Was at 40.12

The 55 Strike Put Is Furthest
In-the-Money So It Is Most Like
Ownership of GM Stock

FIGURE 5.9 Deep In-the-Money Covered Puts in GM and the Bid/Ask Spread

TABLE 5.3 Selling In-the-Money Puts in GM

Stock Price at Option Expiration	Profit from Selling the 55 Strike Put at 14.85	Profit from Buying GM Stock at 40.12
50.00	9.85	9.88
55.00	14.85	14.88
60.00	14.85	19.88

middle of the bid/ask spread, but then there's no assurance that he'd get his order filled. He might end up never selling the put.

Let's assume our put seller sold that March 55 put at 14.85 and that GM did indeed rally sharply. How would this covered put sale fare if GM rallied to 50.00 (a nearly 25 percent rally)? How would this covered put sale fare if GM rallied to the 55 strike price (a 37 percent rally)? How would this covered put sale fare if GM rallied above the 55 strike and was at 60.00 when the option expired? Table 5.3 shows the results for those three outcomes along with the results for simply buying the stock at 40.12.

There is no price for the stock at option expiration for which selling the covered put generates a superior outcome. The outcome doesn't improve if the stock drops either. If the stock were at $30.00 at expiration, then the loss from selling the 55 strike put at 14.85 would be 10.15 (the loss on the stock will be the 25.00 difference between where the put seller will buy the stock, 55.00, and the value of the stock, 30.00, less the 14.85 option premium received). Compare this to the loss of 10.12 (30.00 – 40.12) realized from simply buying the stock at 40.12.

Selling this deep in-the-money put at 14.85 was suboptimal compared to simply buying the stock in every circumstance because the put seller sold this put for less than its inherent value. With the stock at 40.12, the 55 strike put is inherently worth 14.88 (55.00 – 40.12). Any time a trader sells an option for less than its inherent value, he will find the outcome trails simply trading the stock.

The bid price for deep in-the-money puts (and for deep in-the-money calls, although deep in-the-money calls have a strike price significantly below the current market price of the stock) is very often below the inherent value of the option. Blame the market maker's need to make a profit and to execute a bunch of stock to hedge the options they buy from you.

At-the-Money or Nearly At-the-Money

At-the-money options have the greatest time value. For that reason alone, it might make the most sense to stick to selling at-the-money or near at-the-money puts. Let's take another look at MSFT, the very first stock we looked at in Figure 5.1 but extend the data to include the amount of time value in each of those options. You can

TABLE 5.4 MSFT Put Prices and Time Value

Strike Price	Option Price	Option Time Value
34	0.96	0.96
35	1.28	1.28
36	1.65	1.65
37	2.10	2.10
38	2.65	1.81
39	3.25	1.41
40	3.90	1.06

see this time value in Table 5.4. The 37 strike put is trading at 2.10, and all of that 2.10 is time value. That means that the 37 strike put has the greatest time value of any of the options trading in the March expiration. It's no accident that the option that is struck closest to at-the-money is the option with the greatest time value.

The breakeven for that 37 strike put is 34.90, meaning that if MSFT is below 37 at March expiration, then our covered put seller is going to buy the stock at an effective price of 34.90. What are the odds of buying at that effective price? It's the likelihood that MSFT will be below 37.00 at expiration. Remember that as long as MSFT is below that strike price, no matter how far it is below 37.00, the put owner will exercise that put. The delta of that 37 strike put was 47, meaning the odds of buying MSFT at that effective price of 34.90 are 47 percent.

That's pretty good, the odds are nearly 50/50 that we'll buy MSFT at a big discount to today's price. But what are the odds that we'll lose money at March expiration? That's the likelihood that MSFT is below the breakeven price of 34.90 at expiration. And the delta of a hypothetical put option struck at precisely 34.90? The tools at www.OptionMath.com tell us that delta is 27. The likelihood of losing money on this covered put is 27 percent. And interestingly, the likelihood of MSFT's being below the 37 strike price but above that 34.90 breakeven are 20 percent (47 percent – 27 percent). One time out of every five, this covered put seller will end up in the sweet spot where we buy the stock at an effective price lower than it's then trading at. Let's look at all the important likelihoods for this covered put sale in Figure 5.10 and Table 5.5.

Calculating these likelihoods including the likelihoods of the hypothetical levels can help you understand the dynamics of the position you're considering.

Let's compare in-the-money, out-of-the-money, and at-the-money covered puts for a new stock so that we can see how they differ. Figure 5.11 shows potential covered puts in GLD, the gold exchange-traded fund (ETF).

The 106 put was deep out-of-the-money, the 126 put was deep in-the-money, and the 116 put was precisely at-the-money. Figure 5.11 shows the payoff charts for all of those covered puts. In Figure 5.12 you can clearly see that the in-the-money covered

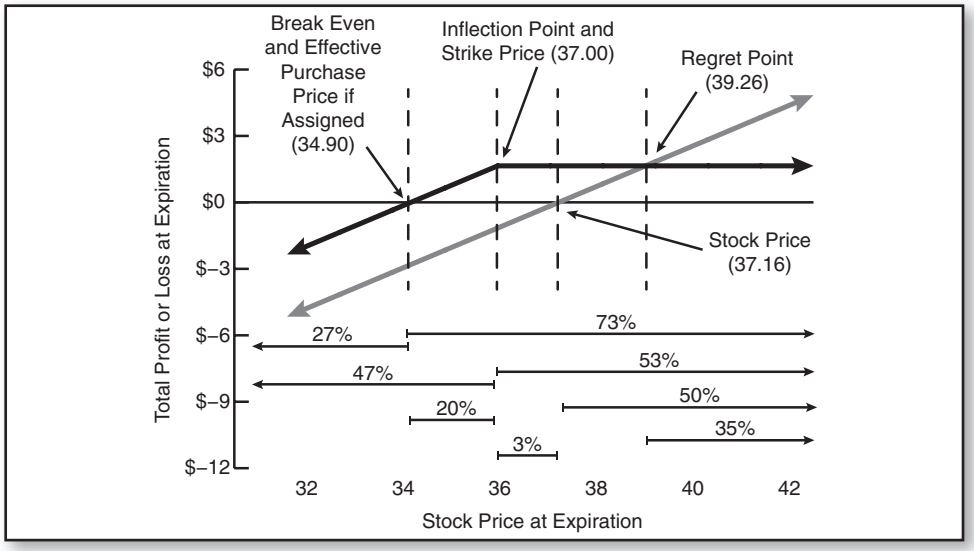


FIGURE 5.10 MSFT At-the-Money Covered Put and the Important Likelihoods

TABLE 5.5 Likelihoods for Our 37 Strike Covered Put

Outcome	Relevant Price at Expiration	Likelihood
Put sale is profitable	MSFT at or above 34.90	73%
Put sale is not profitable	MSFT below 34.90	27%
Put exercised by owner	MSFT below 37.00	47%
Put expires worthless	MSFT at or above 37.00	53%
Put exercised but effective purchase price of stock is below current market price	MSFT below 37.00 but above 34.90	20%
Outright stock purchase is profitable	MSFT above 37.16	50%
MSFT drops but stays above strike price	MSFT below 37.16 but above 37.00	3%

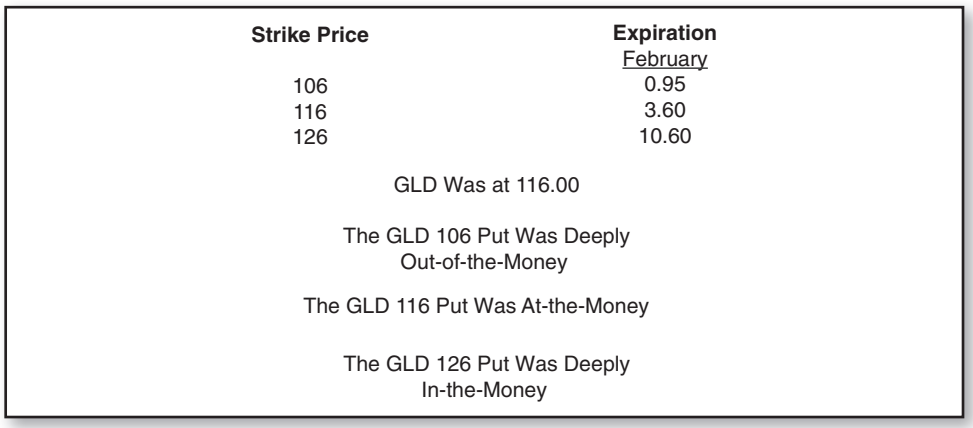


FIGURE 5.11 Three Covered Puts in GLD

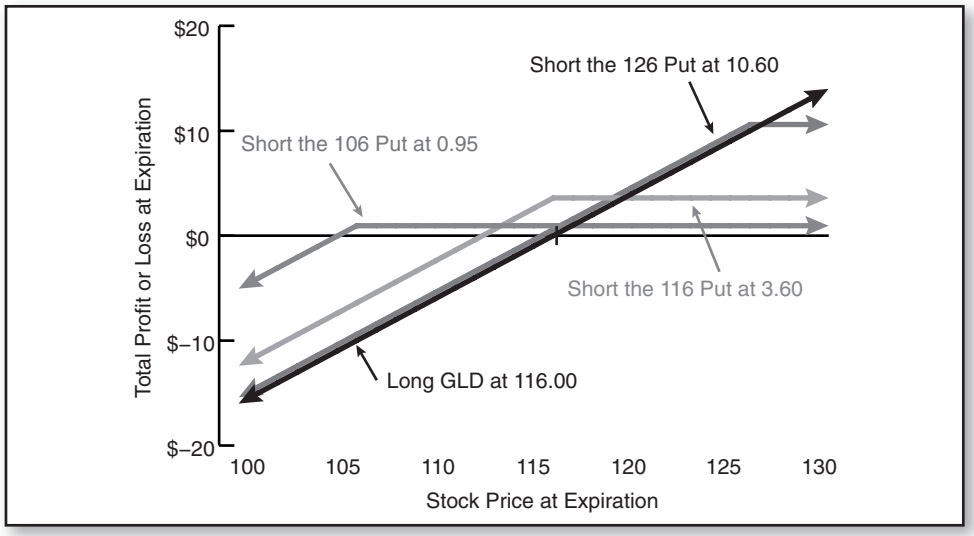


FIGURE 5.12 In-the-Money, Out-of-the-Money, and At-the-Money Options in GLD

put is very much like ownership of the stock with a tiny difference generated by the 0.60 of time value collected.

The out-of-the-money put is very different from ownership of GLD; it generates a very small net profit, the 0.95 of option premium collected, over a very large price range. The at-the-money put's payoff is different. Below the inflection point at 116.00, it is always superior to the performance of GLD by the 3.60 in premium collected. Above the inflection point, its profit is the 3.60 collected, but above 119.60, it trails simple ownership of GLD because GLD is now above the regret point.

Covered Put versus Covered Call

We noted earlier that both a cash-secured put and a covered call have a regret point, above which we regret selling the option. In the case of the covered put, we regret selling the put rather than simply buying the stock. In the case of the covered call, we regret selling the call because the profit we forego on the stock we already own is greater than the call premium received. The payoff charts for the two combinations are also very similar. Why all the similarity? Because assuming the put and call have the same expiration and strike price, the trades are identical. Earlier, we saw that the GLD 116 put was trading at 3.60. The 116 call was trading at 3.60 as well because GLD was at 116.00—if the call had been trading at any other price, there would have been an arbitrage opportunity. Let's see how the two positions would work out for a variety of prices at expiration:

Selling the February 116 Strike Covered Put at 3.60

Total premium collected = $360

Total capital required = $11,240 ($11,600 to buy 100 shares of GLD at 116.00 if assigned minus $360 of put option premium received)

Breakeven point = 112.40

Regret point = 119.60

Profit/loss with GLD at 110.00 at expiration = –2.40

Profit/loss with GLD at 116.00 at expiration = +3.60

Profit/loss with GLD at 122.00 at expiration = +3.60

Buying GLD at 116.00 and Selling the February 116 Strike Call at 3.60

Total premium collected = $360

Total capital required = $11,240 ($11,600 to buy 100 shares of GLD at 116.00 minus $360 of call option premium received)

Breakeven point = 112.40

Regret point = 119.60

Profit/loss with GLD at 110.00 at expiration = –2.40 (loss of 6.00 on long GLD, gain of 3.60 on short call position)

Profit/loss with GLD at 116.00 at expiration = +3.60 (no gain or loss on GLD position, gain of 3.60 on short call position)

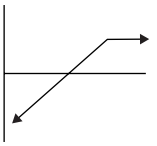
Profit/loss with GLD at 122.00 at expiration = +3.60 (gain of 6.00 on long GLD position, loss of 2.40 on short call position)

While the covered call may result in continued ownership of the stock, it doesn't impact the profit or loss, and the owner of the stock is free to close that position at the example prices at option expiration. Other than that, the two positions are identical. That's because the put and the call will have the same amount of time value.

Buying stock so you can sell a covered call doesn't make much sense when the alternative is selling a covered put. Why pay a commission to buy the stock, then pay a commission to sell the covered call, when you could instead pay a single commission to sell the covered put? No logical trader would do so.

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Covered Put Cheat Sheet

	Covered Put
Description	Short put, long cash to buy stock at the strike price
Example	ATM = 100 Short one 95 strike put Long $9,500
Pay or Collect Premium	Collect
Needed Directionality	
Passage of Time without Market Movement	+ + +
Increase in Implied Volatility without Market Movement	– – –
Payoff Thumbnail Chart	
Maximum Risk	Strike price minus premium received (if stock drops to zero)
Maximum Profit	Premium received
Breakeven Points	Strike price minus premium received

CHAPTER 6

Calendar Spreads

If we thought a company was going to report disappointing earnings we might want to buy a put option on that stock. We have a particular catalyst in mind, the upcoming earnings report, and we know when that report will be issued. We're trying to get exposure for that catalyst, but we probably think that the stock will be mostly sideways until the event so we don't want exposure for the entire period from now to the event.

We could buy that put option and we'd make money as long as the stock fell below the strike price of the put by more than the cost of the option. But lots of traders and investors are going to want exposure to, or protection from, that event, so they're likely to bid up the price of the put option we're thinking of buying. Is there a way to reduce the cost of buying the put that we want to own for that catalyst by selling a shorter-dated put that expires before the catalyst but that will erode away during the period between now and expiration, a period when we expect the stock will move sideways?

We might not have a particular event or catalyst in mind but might want to take advantage of the difference in option erosion by time to expiration that we discussed in Chapter 2. Shorter-dated options erode more quickly; their theta is higher, than longer-dated options. If we were to buy a longer-dated option and sell an option that was identical except for the time to expiration, that is, it was identical except for an earlier expiration date, then we could collect the daily erosion from the option that is eroding quickly while paying the smaller amount of daily erosion from the option that is eroding slowly. Eventually, the front option would expire and we'd be left long that longer-dated option.

What if we thought that a stock was going to rally substantially? If we thought this was the case we might sell an at-the-money put option expecting to collect and keep

all of that premium when the stock rallies. But this means that we have substantial risk if the stock drops. We would end up being put the stock at the strike price. While our effective purchase price would be reduced by the put premium received, this isn't our thesis. We're not interested in owning the stock, we just want to collect and keep the put option premium when the stock rallies. One way to accomplish this after selling our at-the-money put would be to buy a shorter-dated put with the same strike price. Then if the stock dropped the shorter-term put option we own would protect us from the risk of the longer-dated put we're short. While this protection would ultimately disappear when that shorter-dated put expired we could then buy another short-dated put or buy back the put option we're short. If the underlying stock has rallied as we expected then that put would have declined in value and we would buy it back, realizing a profit.

All of these trades are calendar spreads. A calendar spread is executed when you buy (or sell) a longer-dated option and simultaneously sell (or buy) a shorter-dated option that is identical except for the expiration date.

Calendar spreads are sometimes called horizontal spreads because option listings in the newspaper used to have the strike prices for each expiration running vertically up and down the page (hence, the strike spreads we looked at earlier are called vertical spreads) and the different expirations are running horizontally across the page. Calendar spreads are also called time spreads, but we'll generally stick with the term *calendar spread*.

Calendar spreads can be executed using either puts or calls and by buying the longer-dated option while selling the shorter-dated option or by selling the longer-dated option while buying the shorter-dated option. When buying the longer-dated option, we're buying the calendar spread and we'll have to pay some net premium. When selling the longer-dated option, we're selling the calendar spread and we'll collect premium. The easy way to remember this is if we're paying net premium then we're buying. If we're collecting net premium then we're selling.

Calendar spreads can be bullish, bearish, or neutral, depending on the strike price we select and its relationship to the at-the-money level. This means that some calendar spreads, such as neutral calendar spreads, do best with very little volatility and that some calendar spreads do best with a tremendous amount of volatility. Generally, the further the strike price is from at-the-money, the more volatility needed for the trade to be profitable, so the more volatility you would be expecting if you chose to initiate that trade.

Figure 6.1 shows some puts on Oracle (ORCL) that we might use to construct some put calendar spreads.

ORCL stock was trading at 32.78 when these option prices were observed and ORCL was due to report earnings on the Thursday before those June options were to expire.

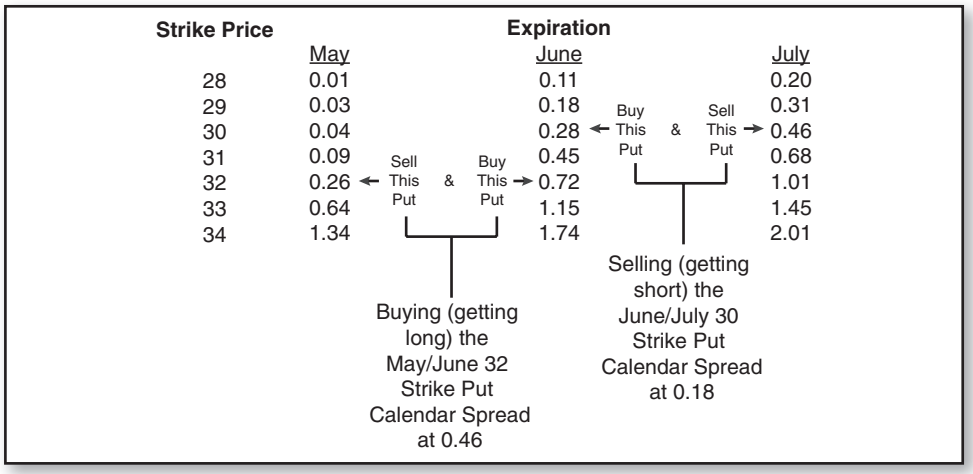


FIGURE 6.1 Two Put Calendar Spreads in ORCL

If we thought ORCL earnings were going to disappoint, then we might buy the May/June 32 put calendar spread. We would do this by buying the June 32 strike put at 0.72 and we reduce the cost of the trade by selling the May 32 strike put at 0.26. The calendar spread would cost us 0.46 (0.72 – 0.26).

The goal of this put calendar spread, in fact for all long calendar spreads, is for the front option, the put option expiring in May in this case, to expire worthless, leaving us long the back month option, the June put in this case. For this trade we have a catalyst in mind: the earnings announcement. Other long calendar spreads may simply try to reduce the cost of the ultimate position or take advantage of the differential option erosion for options with different expirations. If the May put expires worthless we have managed to be long the June put outright for the catalyst and we've reduced the cost of ownership by 0.26, a 36 percent discount.

What does the payoff chart for this calendar spread look like at expiration? That's tough to say. All the other payoff charts we've looked at had objective inputs; we knew what the options would be worth at expiration given the price of the underlying stock. In a calendar spread, we might know what the shorter-dated option is worth at the front expiration, but we'd have to guess what the longer-dated option is worth at that point, and that depends on lots of things including volatility, the unknowable input. Similarly, we can know what the longer-dated option is worth at the second expiration but then we'd have to assume a price for the stock, and thus a value for the front option, on the front expiration date. Because of this, we won't use as many of the type of payoff charts we've used elsewhere. That doesn't mean calendar spreads are that much more complicated or that you can't figure out the payoff; it just means that in order to chart the payoff, we have to make several assumptions.

TABLE 6.1 Outcomes for Our Long Put Calendar Spread in ORCL

Stock Price at June Expiration	Position at June Expiration Assuming May Option Expired Out-of-the-Money	Value of Position at June Expiration	Total Outlay (Cost of Option Calendar Spread)	Net Profit or Loss
28.00	Long June 32 put	4.00	0.46	3.54
30.00	Long June 32 put	2.00	0.46	1.54
32.00	Long June 32 put	0.00	0.46	–0.46
34.00	Long June 32 put	0.00	0.46	–0.46
36.00	Long June 32 put	0.00	0.46	–0.46

It may not be possible to graph the payoff with complete certainty, but it is possible to know the maximum possible risk when buying a calendar spread. The maximum possible risk is what we paid for the calendar spread. Let's look at this May/June 32 strike put calendar and see how the maximum potential risk is the 0.46 paid. We'll look at the profit or loss at June expiration first assuming the May option expired worthless and then again assuming the May option was in-the-money at expiration and we were assigned, meaning we had the stock put to us at 32.00 a share. Table 6.1 shows the outcome assuming the May option expired worthless.

This long put calendar loses a maximum of 0.46 assuming the May option expired worthless. The breakeven is 31.54 (32.00 – 0.46) assuming the May option was out-of-the-money at expiration and expired worthless. The profit increases as ORCL falls below 31.54 and stops increasing only when ORCL falls to zero.

Let's look at these same outcomes assuming that the May option had been in-the-money at expiration and that we had the stock put to us at 32.00. We see this in Table 6.2.

No matter what happens at the first expiration and no matter where the underlying stock is at the second expiration, the maximum loss from buying a put calendar is the initial cost of the put calendar. In fact, the maximum loss from buying any calendar spread, put or call, is the price paid for the calendar spread.

But the nature of the trade changes completely, depending on whether or not the front month option, the May expiration in this case, is in-the-money or out-of-the-money at expiration (and if the option was precisely at-the-money at May expiration? Then the option would probably not be exercised and we would likely be left long the June put but if the May option was exercised our maximum risk would still be 0.46 but, again, the nature of the resulting position would be very different than we want).

It's great to know that our risk is limited but we bought the put calendar spread because we thought ORCL was going to drop after the front option expired. Having the front month expire in-the-money (or at-the-money if we get put the stock)

TABLE 6.2 Outcomes for Our Long Put Calendar Spread in ORCL

Stock Price at June Expiration	Position at June Expiration Assuming May Option Expired In-the-Money	Value of Position at June Expiration	Total Outlay (Cost Stock and Option Calendar Spread)	Net Profit or Loss
28.00	Long shares and long June 32 put	32.00 (stock worth 28.00, option worth 4.00)	32.46 (32.00 for stock, 0.46 for option)	–0.46
30.00	Long shares and long June 32 put	32.00 (stock worth 30.00, option worth 2.00)	32.46 (32.00 for stock, 0.46 for option)	–0.46
32.00	Long shares and long June 32 put	32.00 (stock worth 32.00, option worth 0.00)	32.46 (32.00 for stock, 0.46 for option)	–0.46
34.00	Long shares and long June 32 put	34.00 (stock worth 34.00, option worth 0.00)	32.46 (32.00 for stock, 0.46 for option)	1.54
36.00	Long shares and long June 32 put	36.00 (stock worth 36.00, option worth 0.00)	32.46 (32.00 for stock, 0.46 for option)	3.54

leaves us in a situation where we now need ORCL to go up in order to make money. No option trader wants to be in a situation where he thinks a stock is going down but he needs it to go up in order to make money. This means we need to close the trade or spread into another trade if our front month option is in-the-money at expiration.

Observant readers will recognize that the position that results from the front month option expiring in-the-money, long stock and long a put, is synthetically identical to a long call option. See Chapter 13 on conversions and reversals to learn more about synthetic positions.

Call Calendar Spreads

What if we were bullish ORCL and thought the earnings release just prior to the June expiration would bring good news? We might buy a call calendar to get exposure to the event we're focused on while lowering the cost of the trade. Figure 6.2 shows some ORCL call options we might use to construct call calendar spreads.

We could buy the May/June 34 strike call calendar spread at 0.41 by buying the June 34 strike call at 0.52 and simultaneously selling the May 34 strike call at 0.11.

Even though this is a call calendar the maximum risk is still what we paid for it, 0.41 in this case. Let's do the same sort of math we did previously to confirm this. Table 6.3 shows the potential profit and loss for a range of underlying prices at June expiration assuming the May call option had expired worthless.

This long call calendar loses a maximum of 0.41 assuming the May option expired worthless. The breakeven is 34.41 assuming the May option was out-of-the-money at expiration and expired worthless. The spread is profitable above that breakeven point

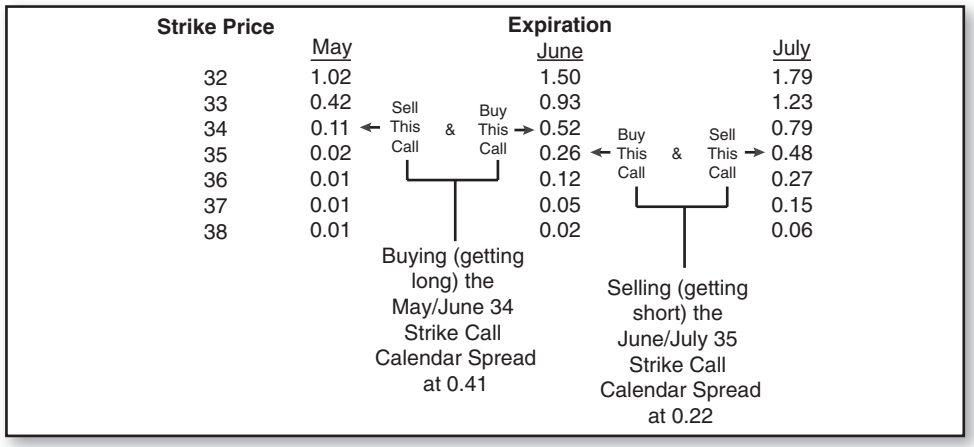


FIGURE 6.2 Two Call Calendar Spreads in Oracle (ORCL)

and the amount of profit increases as long at ORCL stock keeps rallying. Let's look at these same outcomes assuming that the May option had been in-the-money at expiration and that we had to sell the stock at 34.00 by borrowing it (borrowing stock to sell it is shorting the stock). Table 6.4 shows the potential profit and loss for a range of underlying prices at June expiration assuming the may call option was in-the-money at expiration.

No matter what happens at the first expiration and no matter where the underlying stock is at the second expiration, the maximum loss from buying a call calendar is the initial cost of the call calendar. Again, with the front month in-the-money at expiration the directionality of profit after that expiration is contrary to our outlook for the market. Some sort of follow up trade is required.

We've now seen that buying a calendar spread, regardless of put or call, regardless of in-the-money or out-of-the-money at the front expiration, has a maximum potential loss equal to what we paid for the spread.

TABLE 6.3 Outcomes for Our Long Call Calendar Spread in ORCL

Stock Price at June Expiration	Position at June Expiration Assuming May Option Expired Out-of-the-Money	Value of Position at June Expiration	Total Outlay (Cost of Option Calendar Spread)	Net Profit or Loss
30.00	Long June 34 call	0.00	0.41	–0.41
32.00	Long June 34 call	0.00	0.41	–0.41
34.00	Long June 34 call	0.00	0.41	–0.41
36.00	Long June 34 call	2.00	0.41	1.59
38.00	Long June 34 call	4.00	0.41	3.59

TABLE 6.4 Outcomes for Our Long Call Calendar Spread in ORCL

Stock Price at June Expiration	Position at June Expiration Assuming May Option Expired In-the-Money	Cost to Close Position at June Expiration	Total Cash (Received for Stock and Paid for Option Calendar Spread)	Net Profit or Loss
30.00	Short shares and long June 32 call	30.00 (buy stock at 30.00, sell option at 0.00)	33.59 (received 34.00 for stock, paid 0.41 for option)	3.59
32.00	Short shares and long June 32 call	32.00 (buy stock at 32.00, sell option at 0.00)	33.59 (received 34.00 for stock, paid 0.41 for option)	1.59
34.00	Short shares and long June 32 call	34.00 (buy stock at 34.00, sell option at 0.00)	33.59 (received 34.00 for stock, paid 0.41 for option)	–0.41
36.00	Short shares and long June 32 call	34.00 (buy stock at 36.00, sell option at 2.00)	33.59 (received 34.00 for stock, paid 0.41 for option)	–0.41
38.00	Short shares and long June 32 call	34.00 (buy stock at 38.00, sell option at 4.00)	33.59 (received 34.00 for stock, paid 0.41 for option)	–0.41

Now that we recognize the sorts of assumptions we have to make to generate potential payoff charts and that making those assumptions is dangerous and that a calendar spread that sees the shorter-dated option assigned can end up making money only if our market outlook is wrong, let's look at a hypothetical payoff for that May/June 34 strike call calendar that we contemplated buying. We'll assume a range of underlying prices at the May expiration and we'll calculate the hypothetical value of the June 34 call using the tools at www.OptionMath.com assuming the volatility input doesn't change. You can see this payoff in Figure 6.3.

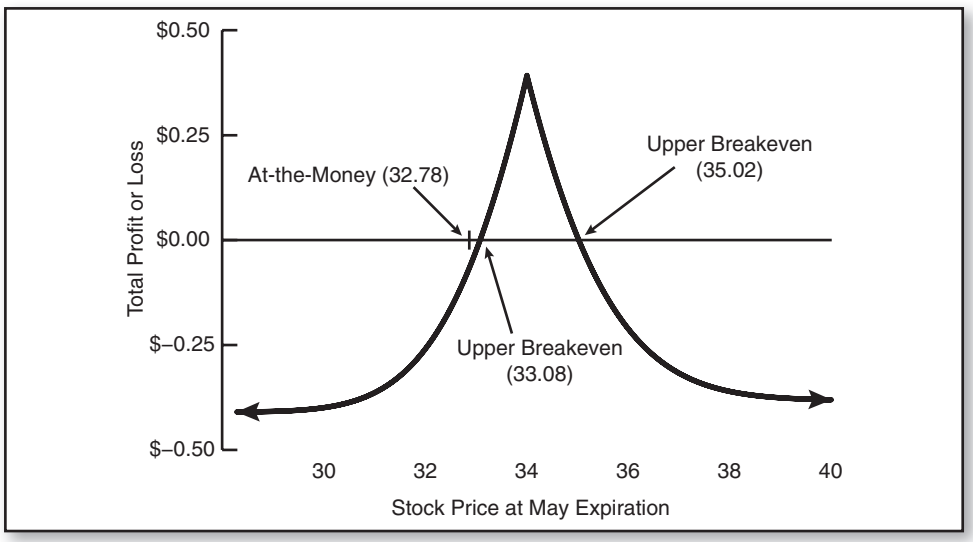


FIGURE 6.3 The May/June 34 Strike Call Calendar Payoff

Notice that the theoretical profit or loss for this call calendar is slightly negative if ORCL doesn't move at all and remains at 32.78 at June expiration. That's because this call calendar is struck relatively far out-of-the-money (34.00 strike price versus the underlying price of 32.78) and because the June option catches the earnings release while May doesn't. This call calendar requires ORCL to rally in order to be profitable. All calendar spreads have directional risk. Some calendar spreads, those struck close to at-the-money, need the underlying stock to stay close to the present level. Some calendar spreads need the underlying to move a little but in the right direction. These, like our 34 strike call calendar, have been struck a little out-of-the-money. Some need the underlying stock to really move; these have been struck substantially out-of-the-money.

This means that long calendar spreads can be very versatile from a market outlook point of view. It's possible to construct a long call calendar that is very inexpensive to initiate but that requires a significant rally in the underlying stock in order for the call calendar to be profitable. It's possible to construct a long put calendar that is very inexpensive to initiate but that requires the underlying stock to drop in value substantially in order for the put calendar to be profitable. It's also possible to construct a calendar that needs the underlying stock to not move very much during the term of the front month option in order to be profitable but these calendar spreads cost more to execute. Let's look at the at-the-money call calendar, the May/June 33 call calendar and see how this call calendar needs ORCL to stay close to its current price of 32.78 to be profitable at June expiration. We can see this in Figure 6.4.

This 33 strike call calendar is profitable as long as ORCL does not move too much before that May expiration; the assumed lower breakeven point is 32.35 and the

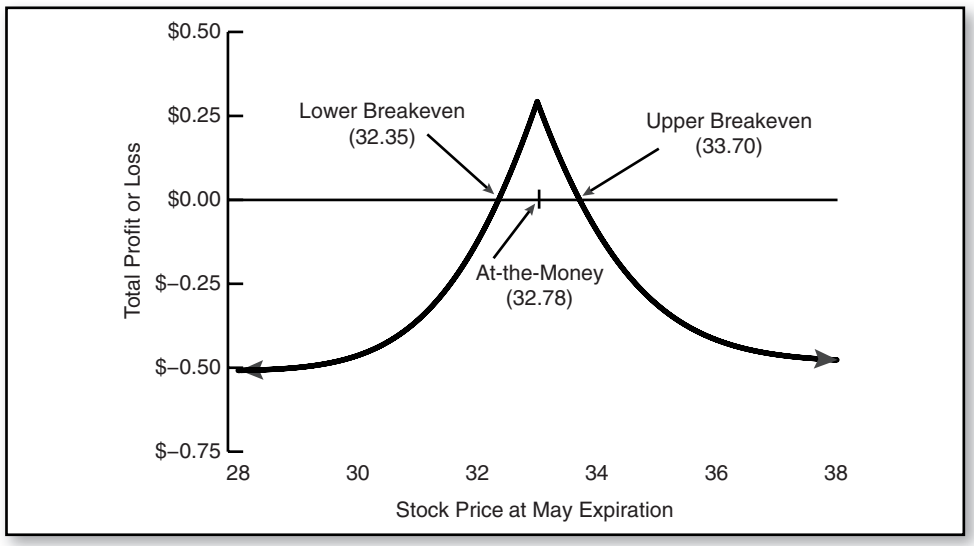


FIGURE 6.4 The May/June 33 Strike Call Calendar Payoff

TABLE 6.5 Differential Erosion for Our Call Calendar

Days to Expiration of May Call Option	Expected Change in May Call Option Price Due to Erosion (Theta)	Expected Change in June Call Option Price Due to Erosion (Theta)	Net Erosion Collected
20	–0.013	–0.011	0.002
15	–0.015	–0.011	0.004
10	–0.018	–0.012	0.006
5	–0.025	–0.012	0.013
1	–0.043	–0.013	0.030

assumed upper breakeven point is 33.70. But this call calendar cost 0.51 versus the 0.41 the 34 call calendar cost.

How is it that this long call calendar makes money at the May option expiration if ORCL doesn't move? The differential erosion of option prices based on time to expiration generates this performance. Let's use the tools at www.OptionMath.com and calculate the erosion of the components of this call calendar spread at several points prior to expiration. We see these in Table 6.5.

And what would this look like if we connected the dots? You can see that in Figure 6.5.

You can see that the net erosion collected increases as expiration of the May option nears. This is exactly what we would expect given what we know about the difference in option price erosion between options with different expiration dates.

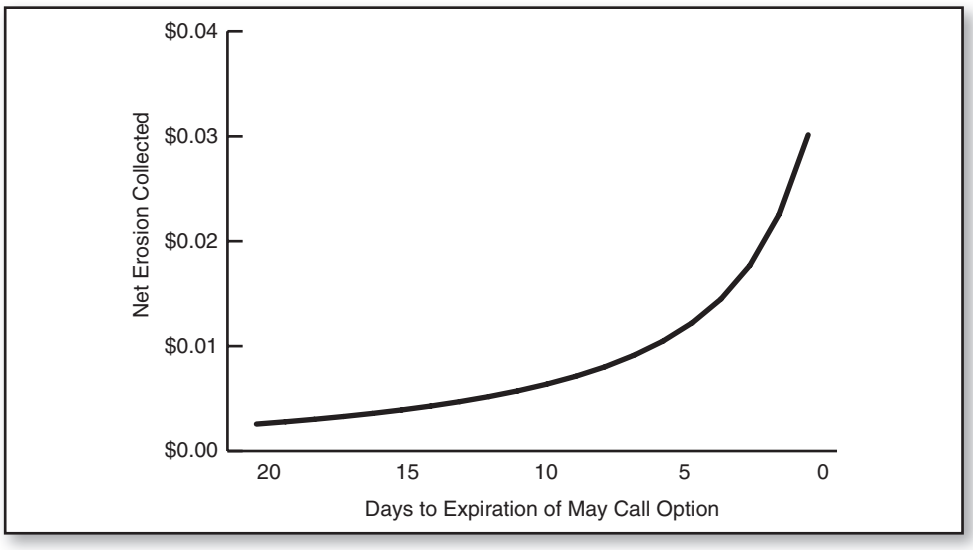


FIGURE 6.5 Daily Net Erosion Collected for 33 Strike Call Calendar

Selling Calendar Spreads

In Figure 6.1, we saw some put options that we might use to construct calendar spreads and we specifically saw how we could sell the July 30 strike put at 0.46 and buy the June 30 strike put at 0.28 to sell the June/July 30 strike put calendar at 0.18. We might do this if we expected ORCL to rally substantially because if ORCL rallies, then the price of both put options will move toward zero. While neither option price will get all the way to zero before expiration, if ORCL rallies substantially we should be able to buy the calendar spread back very cheaply, close our risk and realize a profit.

As with nearly any option or spread we sell, the maximum profit for selling a calendar spread is the premium collected, 0.18 for our June/July 30 strike put calendar. But if the front option expires worthless, the June expiration in this case, we're left short the back month option and that generates significant risk in the case of a put calendar only because the underlying stock can't drop below zero and that generates infinite risk in the case of a call calendar since we're naked short the back month call which can rally in price infinitely.

Let's take a look at Figure 6.6 which shows the same sort of payoff chart we've used for calendar spreads, understanding all the assumptions and estimations that are inherent, and see how this short put calendar spread does at the front expiration.

We know that this payoff makes several assumptions including that the back month option, the July put in this case, maintains the same implied volatility from the time we initiate the trade until the June option expires. In a situation where the

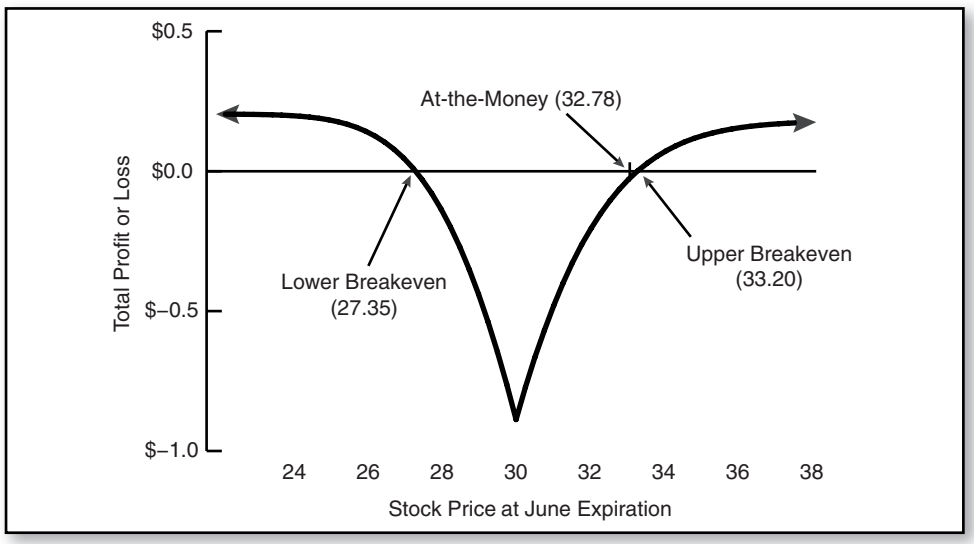


FIGURE 6.6 The Short June/July 30 Strike Put Calendar Payoff

TABLE 6.6 Our Short Put Calendar Spread if ORCL Drops

	Initial Price	Assumed Price with ORCL at 24.00	Time Value Remaining with ORCL at 24.00	Profit or (Loss)
Long June 30 put	0.28	6.01	0.01	5.73
Short July 30 put	0.46	6.02	0.02	(5.56)
June/July put calendar	0.18	0.01	0.01	0.17

underlying drops substantially, that's not likely to be the case. It's likely that implied volatility will increase meaning that the loss at June expiration will be even greater since it will cost more than expected to repurchase that July put to extinguish the trade and the risk.

How is it that this short put calendar is profitable if ORCL drops substantially or rallies substantially? Let's look at our assumed option prices with ORCL at 24.00 and at 37.00 at the June expiration. We see this in Tables 6.6 and 6.7.

The goal of selling a calendar spread is to have all the time value come out of both options so that the longer-dated option can be repurchased very cheaply, thereby extinguishing that risk. When this occurs, the maximum potential profit, or very nearly the maximum potential profit, is realized.

The goal of buying a calendar spread is to have all the time value out of the front option while having as much time value as possible in the back option. Since an option has the maximum amount of time value when it is at-the-money this means that a long calendar maximizes its value at the front expiration when the stock is at the strike price of the long calendar. If the strike price was at-the-money when we executed the calendar then this means we want it to stay there. If the strike price was out-of-the-money when we executed our long calendar spread then we want the underlying stock to move to that strike price. Calendar spreads can be directional trades. If the strike price was substantially out-of-the-money then we need the underlying stock to move substantially. In this case our long calendar is not only a directional trade but it needs substantial volatility as well.

TABLE 6.7 Our Short Put Calendar Spread if ORCL Rallies

	Initial Price	Assumed Price with ORCL at 37.00	Time Value Remaining with ORCL at 37.00	Profit or (Loss)
Long June 30 put	0.28	0.01	0.01	(0.27)
Short July 30 put	0.46	0.02	0.02	0.44
June/July put calendar	0.18	0.01	0.01	0.17

Directionality

Since a long calendar spread does best with the underlying stock at the strike price of the options at the expiration of the front month, a long calendar has significant directionality. We could establish a long calendar spread to satisfy nearly any market outlook. The further the strike price is from at-the-money the more we need the market to move in order to achieve maximum profit. If the strike is close to at-the-money, as with the 33 strike call calendar we looked at, we don't need the market to move in order to generate a profit at the first expiration. In fact, we want ORCL to not move. But the 34 strike was further from at the money, it was 3.7 percent out-of-the-money, so it needs ORCL stock to move upward to get to breakeven since June expiration catches earnings and May does not. That breakeven is about 33.08. What would happen if we selected strike prices for our call calendar spread that were even further out-of-the-money? Then we'd create calendar spreads that would cost less to initiate, that would potentially generate greater profit, that would require more movement to breakeven, and that would require more movement to achieve that maximum potential profit. Let's look at the 34 call calendar as well as the 36 and 38 strike call calendars to see the difference generated by moving further out-of-the-money. You can see all three hypothetical payoffs in Figure 6.7.

As the strike price of the calendar spread increases the directionality of the spread increases; the lower breakeven point rises, the upper breakeven point rises, and the point of maximum profit rises—this point of maximum profit is also the strike price of the calendar spread. The same is true of put calendars.

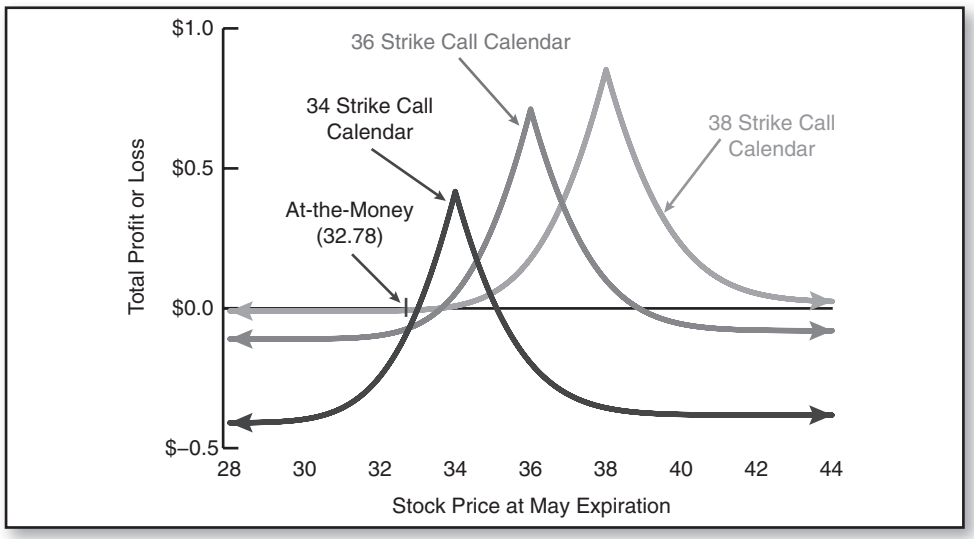


FIGURE 6.7 Call Calendar Spreads and Directionality

TABLE 6.8 Three Out-of-the-Money Call Calendar Spreads

	Lower Breakeven Point	Necessary Move to Reach Lower Breakeven Point	Upper Breakeven Point	Allowed Move before Reaching Upper Breakeven Point
34 strike call calendar	33.08	0.9%	35.02	6.8%
36 strike call calendar	33.63	2.6%	38.88	18.6%
38 strike call calendar	33.65	2.7%	44.22	34.9%

As the strike price of the call calendar spread decreases the upper breakeven point decreases, the lower breakeven point decreases and the point of maximum profit (the strike price) decreases. You can see these points for our three call calendars in Table 6.8.

We can use the tools at www.OptionMath.com to figure out the likelihoods that each of these call calendars will be profitable. We find that the likelihood of the 34 call calendar being profitable is 38 percent. For the 36 call calendar, it's 29 percent. For the 38 call calendar it's 38 percent. Don't be misled by the 38 call calendar; the fact that those options were very inexpensive in absolute terms, 0.01 and 0.02, means we should be careful about what any option model tells us as all models tend to generate strange results for very inexpensive options. And there's no guarantee that we could buy this 38 strike call calendar for the 0.01 difference between the two nominal option prices. If the May 38 call market is actually no bid/0.01 ask and the June 38 call market is actually 0.02 bid/0.03 ask then the best we could do is to just buy the June 38 call outright at 0.03. That result would very different from the call calendar we've been examining.

Catalysts

The ORCL earnings release we're focused on occurs just a few days prior to the June options expiration. That means the June and July options will participate in the resulting move while the May options will have already expired when that earnings report is released. Users of calendar spreads have to be aware of catalysts and how they might impact the later expiration but not the first expiration of their calendar spread. Catalysts can include earnings releases, dividends, new product releases, release of clinical trial data and many other types of market moving events.

The fact that the catalyst doesn't impact the front expiration means that the sort of differential erosion we're hoping to capture may not exist. In Chapter 2,

TABLE 6.9 ORCL Option Prices and Catalysts

May 34 Call with 20 Days to Expiration (Market Price)	What June 34 Call Price Would Be if It Were a Function of May Call Price	Actual June 34 Call Price	What July 34 Call Price Would Be if It Were a Function of May Call Price	Actual July 34 Call Price
0.11	0.275 (0.11 × (50/20))	0.52	0.44 (0.11 × (80/20))	0.79

we discussed differential erosion and how we're generally better off selling a series of shorter-dated options rather than a single longer-dated option. Let's look at our call options on ORCL and see if this holds when one expiration catches the catalyst and the other doesn't catch it. Remember that the May options had about 20 days to expiration, the June options had about 50 days to expiration and the July options had about 80 days to expiration. We can see these relationships in Table 6.9.

Obviously, an important catalyst like an earnings release impacts the relationship between options with an expiration that catches the catalyst and options that don't catch the catalyst. That doesn't mean you shouldn't use these types of calendar spreads; it simply means that they won't act like other calendar spreads.

The Super Calendar

So your long calendar spread has worked; the front option is going to expire worthless and you'll be left long the back month option. The profit on the expiring option is greater than the loss on the back month option that we'll be left long. But if your goal was to capture the differential erosion rather than set yourself up for a catalyst, then you can't simply stay long that naked back month option. It will continue to erode away, and since it's now closer to expiration than it was when you initially bought it, it will start to erode more quickly. Erosion made our calendar spread profitable. Erosion of the lone remaining option can make our calendar spread ultimately unprofitable if we don't do something. We could sell the remaining option and take our profit, or we could add to our winner by turning our calendar into a super calendar by selling another option, identical to the remaining option but with a shorter time to expiration. For example, if our initial calendar had us long an option with 120 days to expiration and short an option with 30 days to expiration, then when that front option expires we'll be left with our long option, which now has 90 days to expiration. If we sell a new option identical to the 90-day option but with only 30 days to expiration, we'll have a new calendar spread and we'll have executed a super calendar. Table 6.10 shows how we might execute a super call calendar spread.

TABLE 6.10 A Super Call Calendar Spread

The March/June 50 Strike Call Calendar When Initiated	
Stock Price	49.00
March 50 Strike Call Option	1.25
June 50 Strike Call Option	3.00
Cost of the Call Calendar Spread	1.75
At the March Expiration	
Stock Price	49.00
March 50 Strike Call Option	0.00
June 50 Strike Call Option	2.55
Value of the Call Calendar Spread	2.55
Unrealized Profit	0.80
After Selling the April 50 Strike Call Option to Create a Super Calendar	
Stock Price	49.00
April 50 Strike Call Option	1.25
June 50 Strike Call Option	2.55
Cost of the New Calendar Spread	1.30
At the April Expiration	
Stock Price	49.00
April 50 Strike Call Option	0.00
June 50 Strike Call Option	1.95
Value of the Call Calendar Spread	1.95
Unrealized Profit	0.65
Total Profit (From Both Calendar Spreads)	1.45

We've turned our initial call calendar spread, the March/June call calendar, into a super calendar by selling an April call after the March call has expired worthless. Once the April call expires, we can do this again by selling a May 50 strike call.

Note that the profit from the second calendar, the April/June calendar, is less than the profit from the first calendar. That's because the difference in daily erosion is decreasing as the June option gets closer to expiration and starts to erode more quickly. If we did this again and created the May/June call calendar, we'd find that the profit would decrease again.

A super calendar is a great way to sensibly add to a winner, since the risk for a long calendar is limited. It's also a good way to rehab a calendar spread that didn't work out because the front month option was in-the-money at expiration. By closing that expiring option and executed a new option that expires before the longer-dated option we've reset the favorable erosion.

Calendar Spread Cheat Sheet

	Long Call Calendar Spread	Short Call Calendar Spread	Long Put Calendar Spread	Short Put Calendar Spread
Description	Long longer-dated call, short shorter-dated call with same strike	Short longer-dated call, long shorter-dated call with same strike	Long longer-dated put, short shorter-dated put with same strike	Short longer-dated put, long shorter-dated put with same strike
Example	ATM = 100 Long 105 call expiring June Short 105 call expiring March	ATM = 100 Short 105 call expiring June Long 105 call expiring March	ATM = 100 Long 95 put expiring June Short 95 put expiring March	ATM = 100 Short 95 put expiring June Long 95 put expiring March
Pay or Collect Premium	Pay	Collect	Pay	Collect
Needed Directionality				
Passage of Time without Market Movement	+ +	– –	+ +	– –
Increase in Implied Volatility without Market Movement	+ +	– –	+ +	– –
Payoff Thumbnail Chart	Too many assumptions required	Too many assumptions required	Too many assumptions required	Too many assumptions required
Maximum Risk	Cost of the spread	Theoretically unlimited	Cost of the spread	Theoretically unlimited
Maximum Profit	Theoretically unlimited	Net premium received	Theoretically unlimited	Net premium received
Breakeven Points	Too many assumptions required	Too many assumptions required	Too many assumptions required	Too many assumptions required

CHAPTER 7

Straddles

A straddle isn't an option spread; rather it's an option combination. It's a combination of options because a straddle buys both a call and a put with the same strike price and expiration or sells both a call and a put with the same strike price and expiration. The strike price is usually the strike price nearest to at-the-money.

If you thought that a stock was going to experience a big move you'd buy options to take advantage of that move. If you thought the move was going to be upward you'd buy call options. If you thought the move was going to be downward you'd buy put options. What if you knew there was a big catalyst imminent such as an earnings release, court verdict, or Food and Drug Administration decision and you thought the catalyst would result in a big move, but you didn't know in which direction? You could buy both a call and a put. That is a long straddle.

If you thought a stock was not going to move very much, then you might sell options. You could sell a put and collect, and ultimately keep, most or all of the premium received when the put option expired as long as the stock didn't drop too much. You could sell a call and collect, and ultimately keep, most or all of the premium received when the call option expired as long as the stock didn't rally too much. Or you could sell both a call and a put and keep most of the premium received as long as the stock didn't move too much in either direction. It would be tough to keep absolutely all of the premium received from selling a straddle, as that would require the underlying stock to close precisely at the strike price of the options on expiration, but we'd keep the vast majority of the premium received if the stock closed near the strike price on expiration.

A long straddle is a defined risk strategy with unlimited profit potential. The underlying stock can move in either direction but substantial volatility is required for a long straddle to be profitable.

A short straddle is a defined maximum profit strategy with unlimited loss potential if the underlying stock moves enough in either direction. A short straddle would be executed only if you assumed there would be little volatility for the term of the straddle.

Just like a politician who "straddles the fence" in an effort to be on both sides of an issue simultaneously, a long option straddle is both bullish and bearish at the same time. A long straddle needs the stock to move. In most cases, it needs the stock to move a bunch, in some cases it needs the stock to move a whole bunch. This need for the stock to really move is the price paid for not having to get the direction correct.

This need for the stock to really move, that is, to be really volatile, is why we'd say a long straddle is long volatility, the buyer has bought volatility in the form of both options; if implied volatility increases immediately after buying the straddle, then the trade will show an unrealized profit. However, a short straddle is a short volatility trade. We want as little volatility as possible, since a straddle is usually struck very close to at-the-money. We'll discuss the greeks of straddles later in this chapter, and you can always calculate the greeks for your straddle at www.OptionMath.com or see the most important ones explained in simpler language in the Cheat Sheet that follows this and every chapter, but the important takeaway is that volatility is critically important for a straddle. A long straddle demands it; a short straddle abhors it.

So an option straddle includes the purchase (or sale) of both a call option and a put option with the same strike price and expiration date. Since you don't know the direction of the ultimate move or can't decide which you think is most likely and instead buy both a put and a call, buying a straddle is the blunt instrument of the option combination world.

For example, if a biotechnology or drug company was about to learn the fate of their problematic but potentially lucrative new drug, then the stock would likely experience a big move once the news was released. If the drug is approved, then the move would be upward. If the drug is denied approval, then the move would be downward.

Figure 7.1 shows how you might buy a straddle on a biotechnology stock which was trading at 20.95.

The underlying stock was at 20.95, so the 21 strike was the at-the-money strike and straddles usually use the strike price that is closest to at-the-money. You could strike a straddle far from at-the-money but that straddle has substantial directionality and since one of the constituent options will be deeply in-the-money, the bid/ask spread will create problems for the execution of any deeply in-the-money straddle. We'll focus on at-the-money straddles. In this case, we would execute a long straddle by buying one of the 21 strike calls at 2.40 and buying one of the 21 strike puts at 2.45. The straddle would cost a total of 4.85. As we've said, this underlying stock is a biotechnology stock, which tend to be very volatile, so the options are very expensive; the straddle cost 23 percent of the price of the stock.

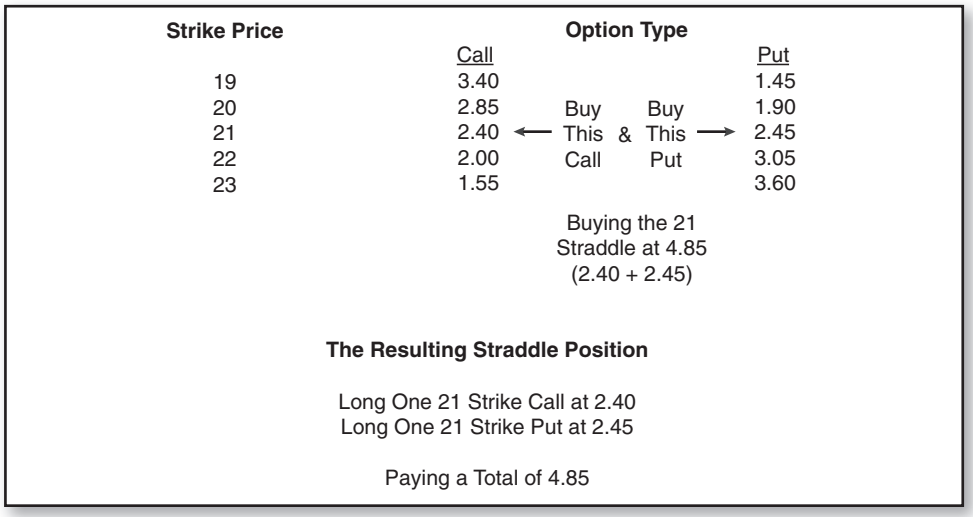


FIGURE 7.1 A Straddle

We're long the straddle and long straddles have limited risk. As with nearly every long spread or combination, that risk is the cost of the spread or combination. In this case, that's 4.85. Long straddles also have unlimited profit potential, at least if the stock rallies. The profit potential to the downside is substantial but is limited by the fact that the stock price can't drop below zero. If the stock does go to zero, then the profit is 16.15 (21.00 – 4.85), but the stock could rally indefinitely so there's no way to calculate the maximum profit if the stock rallies. But going to zero and rallying to infinity are both pretty unlikely outcomes. What is the profit or loss for our straddle if the stock moves in a way that's more reasonable? Let's calculate those numbers using the sort of profit and loss table that we've used before. We'll revisit this sort of table, since this is the first combination we've discussed with both puts and calls. And note that we're figuring the profit or loss for our straddle as we should, as the combination of a long call and a long put. You can see this in Table 7.1.

As we've seen previously, nearly every option spread realizes its maximum profit when the underlying is at the short strike at expiration and realizes its maximum loss when the underlying is at the long strike at expiration. A straddle isn't a spread, it's a combination but the same guideline holds, a long straddle experiences its greatest loss, the price paid for the straddle, when the underlying is at the strike price of the options at expiration. In a long straddle there's no short option, there is nothing but long options so the damage done if the underlying is at the long strike at expiration can be severe. You can see this in Figure 7.2.

Our 21 strike straddle loses the entire 4.85 if the underlying stock is at precisely 21.00 at option expiration. Being at precisely 21.00 at expiration is pretty unlikely

TABLE 7.1 Profit and Loss for Our Long Straddle

Stock Price at Option Expiration	Value of 21 Call at Expiration	Profit or Loss on 21 Call at Expiration	Value of 21 Put at Expiration	Profit or Loss on 21 Put at Expiration	Total Profit or Loss for Straddle
15	0.00	–2.40	6.00	3.55	1.15
16	0.00	–2.40	5.00	2.55	0.15
17	0.00	–2.40	4.00	1.55	–0.85
18	0.00	–2.40	3.00	0.55	–1.85
19	0.00	–2.40	2.00	–0.45	–2.85
20	0.00	–2.40	1.00	–1.45	–3.85
21	0.00	–2.40	0.00	–2.45	–4.85
22	1.00	–1.40	0.00	–2.45	–3.85
23	2.00	–0.40	0.00	–2.45	–2.85
24	3.00	0.60	0.00	–2.45	–1.85
25	4.00	1.60	0.00	–2.45	–0.85
26	5.00	2.60	0.00	–2.45	0.15
27	6.00	3.60	0.00	–2.45	1.15

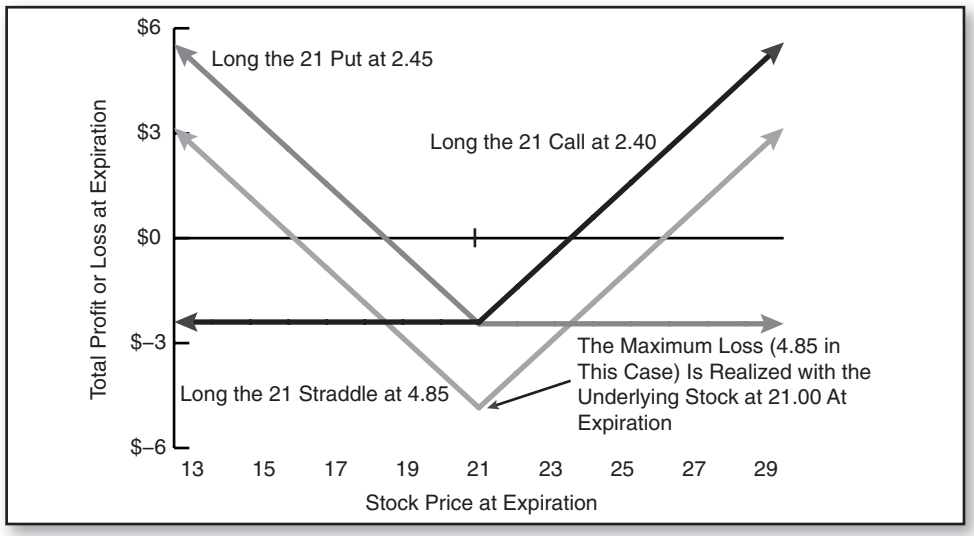


FIGURE 7.2 The Payoff for Our Long 21 Strike Straddle

so let's see how far from 21.00 the underlying has to be in order for this straddle to at least break even at expiration.

Just how far does a straddle have to move in order to break even and how are those breakeven points calculated? The downside breakeven is the strike price minus the cost of the straddle. The upside breakeven is the strike price plus the cost of the straddle. At both of those points the value of the straddle at expiration is exactly equal to the amount originally paid for it. You can see these breakeven points in Figure 7.3.

The breakeven points make sense. At 25.85, the 21 strike put will expire worthless, but the 21 strike call will be worth 4.85. Since that's what we paid for our straddle, we'll break even. At 16.15, the 21 call will expire worthless, but the 21 strike put will be worth 4.85. Since that's what we paid for our straddle, we'll break even.

In both Figure 7.2 and Figure 7.3 you can see the long straddle as the sum of the parts, as the sum of the long call and the long put. In Figure 7.3, you can also see that the downside breakeven is 16.15 (21.00 – 4.85) and the upside breakeven is 25.85 (21.00 + 4.85). Between these two breakeven points, 16.15 and 25.85, the straddle loses money. That's a huge range, 9.70 for a $21 stock, where our straddle will be unprofitable. This straddle is certainly more expensive than most because the underlying biotechnology stock is potentially volatile and the options are displaying a high implied volatility but this stock would have to move up or down about 23 percent in order to simply break even. A long straddle is the blunt instrument of option weapons, but it's also a pretty expensive weapon to wield.

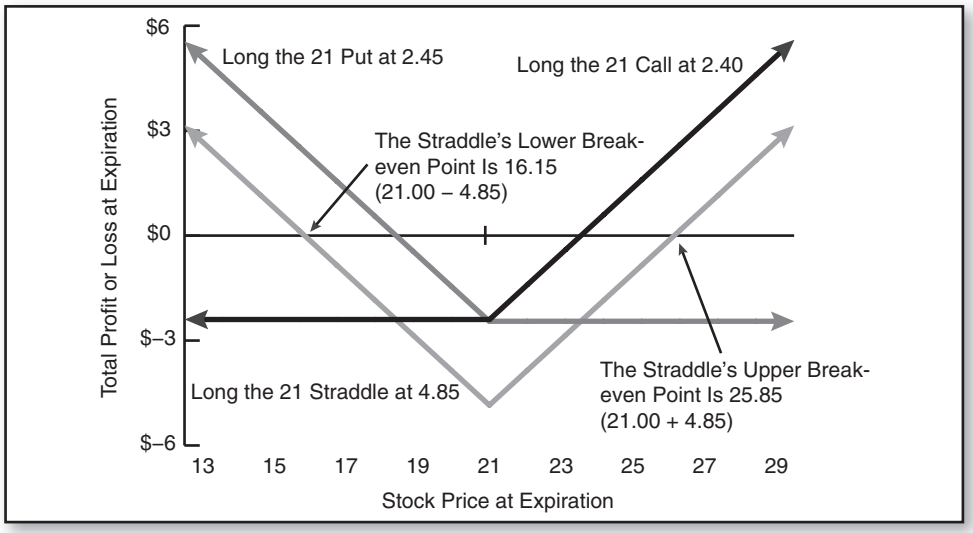


FIGURE 7.3 Where Our Straddle Breaks Even

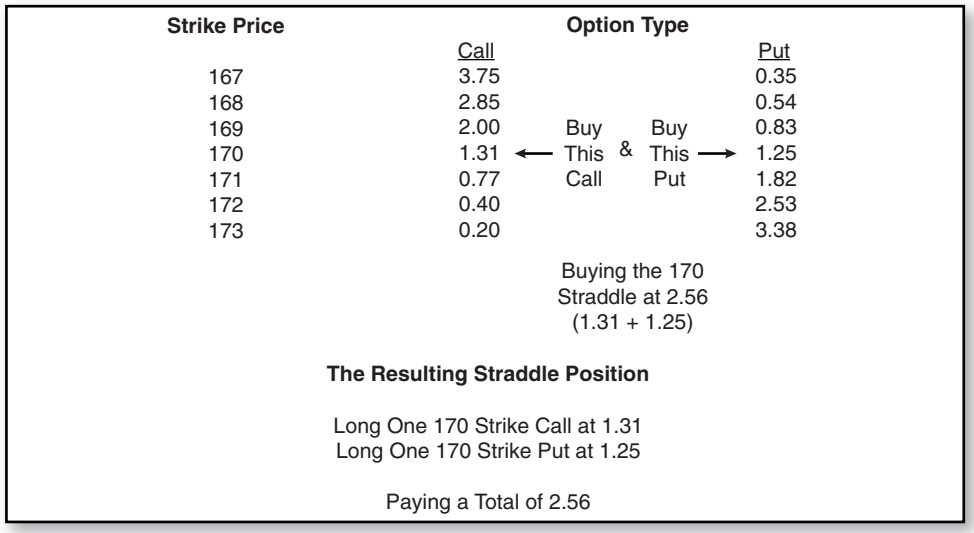


FIGURE 7.4 Buying a SPY Straddle before a Fed Meeting

Let's look at a more reasonably priced straddle but again, let's make certain that it's a market situation when we might think the market is really going to move but we don't have an opinion about direction.

The SPY option prices in Figure 7.4 were observed during the morning of a day when an important Federal Reserve announcement was expected. The announcement could have been bullish or bearish.

These options were due to expire in just three days and the implied volatility of SPY, even though there was a major event due, was much lower than the implied volatility of the biotechnology stock we looked at earlier. You can use the tools at www.OptionMath.com to calculate these implied volatilities.

If we bought this straddle we'd buy both the 170 call at 1.31 and the 170 put at 1.25. The straddle would cost a total of 2.56. As with all straddles, the lower breakeven point is the strike price minus the cost of the straddle or 167.44 (170.00 – 2.56). The upper breakeven is the strike price plus the cost of the straddle or 172.56 (170.00 + 2.56). This straddle would require a move of only about 1.5 percent to break even. You can see this in Figure 7.5.

This long straddle profit and loss chart shows the straddle as a combination of a long call and long put for a specific reason. The straddle payoff moves up in both directions at a 45-degree angle from the maximum loss of 2.56. Similarly, the payoff for each individual option moves up at a 45-degree angle from its maximum loss. But the payoff for each individual option, once the individual option value starts to move higher, will always be greater than that of the straddle because the

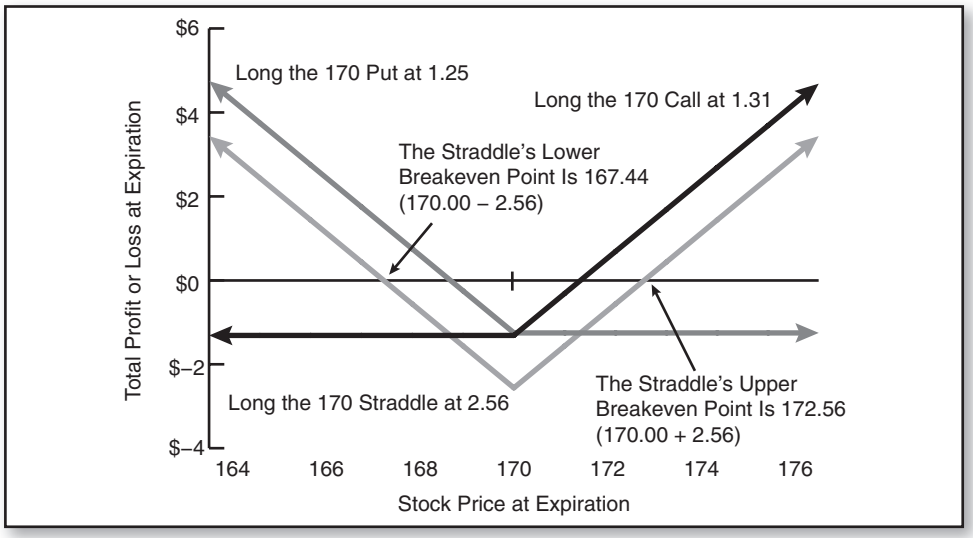


FIGURE 7.5 Buying a Straddle In SPY

straddle has to pay for the other option, the option that's not valuable at expiration. If the long call alone has value at expiration the straddle still has to pay for the worthless put, if the long put alone has value at expiration the straddle still has to pay for the worthless call.

The straddle will never be as profitable as the individual option that has value at expiration. Of course, with a straddle you don't have to get the direction correct but with an individual option, while you have to get the direction right, you're not paying for an option that will ultimately be worthless and one certainty with a long straddle taken to expiration is that one of the options will be worthless.

The lower breakeven point for the straddle will always be lower than the breakeven for the put alone by the cost of the call. The upper breakeven point for the straddle will always be higher than the breakeven for the call alone by the cost of the put. The profit or loss of the straddle will always be below that of the individual put by the cost of the call if the underlying is below the strike price of the straddle at expiration. In this case we're long a straddle, so the breakeven points being further away is a bad thing. Later we'll discuss shorting a straddle and in that case the breakeven points being further away is to our advantage.

Similarly, the upper breakeven point for the straddle will always be higher than the breakeven for the call by the cost of the put; the underlying has to move higher for the straddle to be profitable. The profit or loss of the straddle will always be below that of the individual call by the cost of the put. You can see this in Figure 7.6.

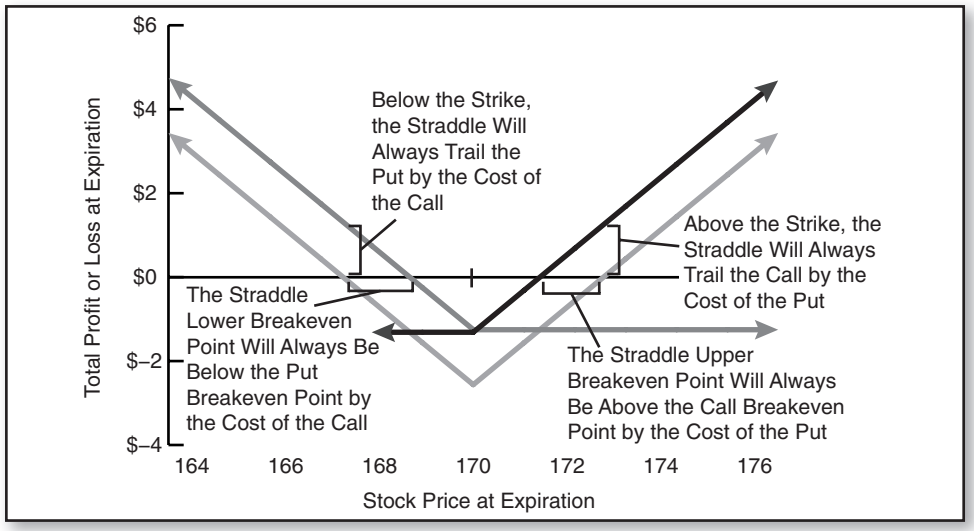


FIGURE 7.6 Our Long Straddle in SPY versus the Constituent Options

The Short Straddle

If the long straddle has the potential for unlimited profit, then the short straddle must have the potential for unlimited loss, and it does. But that doesn't mean you should never sell a straddle. If the straddle has to move a long way to get to breakeven, the biotechnology stock had to move 23 percent to get to breakeven, then maybe selling a straddle isn't such a crazy idea. We'll discuss specific situations when we might sell a straddle a little later in this chapter but first, let's look at Figure 7.7

Strike Price	Option Type: Call			Put
47	2.75			0.75
48	2.05	Sell	Sell	1.05
49	1.50 ←	This &	This →	1.50
50	1.00	Call	Put	2.00
51	0.70			2.70

Selling the 49 Straddle at 3.00 (1.50 + 1.50)

The Resulting Straddle Position

Short One 49 Strike Call at 1.50
Short One 49 Strike Put at 1.50

Collecting a Total of 3.00

FIGURE 7.7 Selling a Straddle in Deutsche Bank (DB)

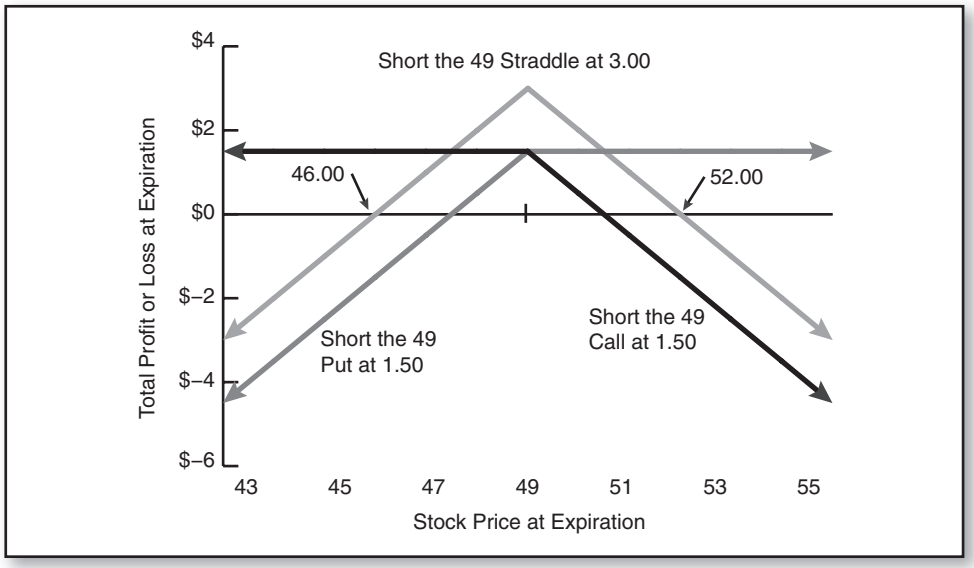


FIGURE 7.8 A Short Straddle in Deutsche Bank (DB)

and the numbers generated in selling a straddle. These option prices on Deutsche Bank (DB) were recently observed.

We could sell this Deutsche Bank straddle at 3.00. Deutsche Bank was obviously very close to 49.00. We know this because the call and put prices are nearly identical. If the underlying stock was below 49.00 then the put would be worth more than the call. If the underlying stock was above 49.00 then the call would be worth more than the put.

What does the payoff chart for this short straddle look like? We see that in Figure 7.8.

The lower breakeven for this short straddle is 46.00 (49.00 – 3.00) and the upper breakeven for this short straddle is 52.00 (49.00 + 3.00). If the underlying stock is between those two levels at expiration then this short straddle will be profitable. If it's outside that range, then the short straddle will lose money because the in-the-money option we're short will be worth more than the total premium collected.

Just as a long straddle is hindered by the fact that the profitable option has to pay for the unprofitable option, the short straddle is helped by the fact that the more profitable option, which expires worthless, can offset some or all of the loss, if there is a loss, on the option that expires in-the-money. And remember, unless the underlying stock closes precisely at-the-money, 49.00 in this case, at expiration, one of the legs of our straddle, no matter whether long the straddle or short the straddle, will be in-the-money. For our short straddle this in-the-money option might still be profitable for us; it might be in-the-money at expiration by an amount that is less than the premium originally received for selling it. For example, given the short straddle on Deutsche Bank (DB), if the stock is at 48.50 at expiration then the call is going to expire worthless and will be profitable by the full 1.50 collected. But the put will be profitable for us

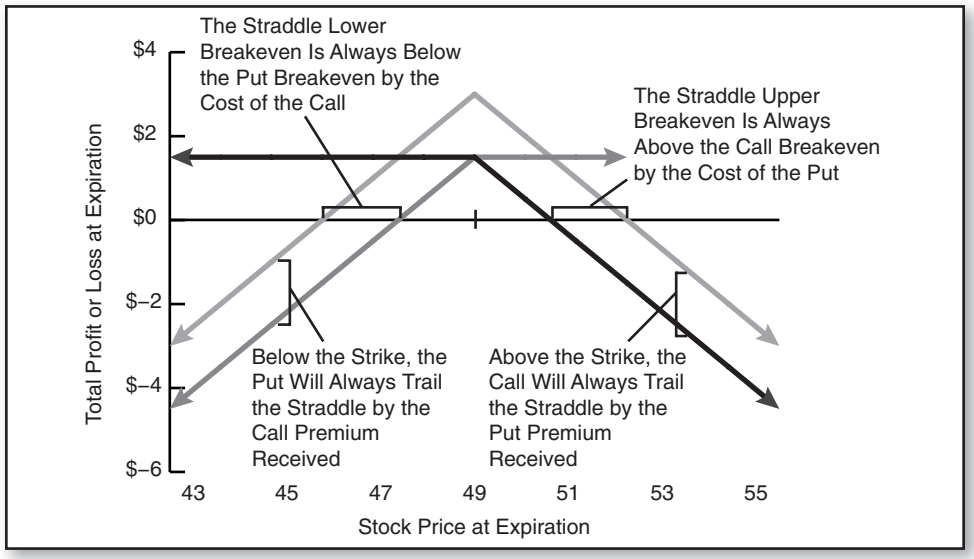


FIGURE 7.9 Our Short Straddle in Deutsche Bank (DB)

too, we received 1.50 for selling it but it will only cost 0.50 to close out at expiration. One option expires worthless, the other was profitable even though it expired in-the-money, and the short straddle was profitable by 2.50 in total.

The fact that at least one option comprising the straddle will expire worthless means that the lower breakeven for a short straddle is always below the breakeven for a short put. That is, the stock has to drop farther to get to the straddle's lower breakeven than it has to drop to get to the short put's breakeven; the stock has to drop farther before the straddle starts losing money than the stock has to drop before the short put alone starts losing money. The upper breakeven for a short straddle is always above the breakeven for a short call; the stock has to rally further to get to the straddle's upper breakeven than it has to rally to get to the short call's breakeven. You can see this in Figure 7.9.

Likelihoods

We've seen where the breakevens are for a straddle, whether it's long or short, and we know that the lower breakeven point is the strike price minus the price of the straddle while the upper breakeven point is the strike price plus the price of the straddle.

What is the likelihood of at least reaching one of those breakevens? That's the likelihood that the underlying stock is below the lower breakeven point or above the upper breakeven point. We know that the delta of an option is the likelihood that it will be in-the-money at expiration so let's use the tools at www.OptionMath.com to

calculate the delta of a hypothetical put with a strike price equal to that lower breakeven and the delta of a hypothetical call with a strike price equal to that upper breakeven. Adding those two likelihoods together is the likelihood that the short straddle will lose money. The delta of the 46 strike put was 20. And the delta of that 52 call? That was 23. That means the odds of the underlying stock being below the lower breakeven or above the upper breakeven is 43 percent. Since above that upper breakeven or below the lower breakeven means the straddle loses money for the seller, that 43 percent is the likelihood this straddle will lose money. As an aside, some are probably asking why the delta of the put is of lower magnitude than the delta of the call if they're both equidistant from at-the-money. It's because option models don't think they're equidistant. They may both be 3.00 from at-the-money but, to oversimplify, 3.00 is a bigger portion of 46 than it is of 52 making a move to 46 less likely than a move to 52. This relationship isn't always the case. Puts may have higher deltas than equidistant calls if option skew results in the puts displaying a higher implied volatility than the calls.

So the likelihood of this straddle being beyond those breakevens is 43 percent. The same would be true if we were long this straddle, the odds of the underlying being beyond the breakevens are agnostic as to whether we're long or short the straddle, the only thing that matters is that the long straddle wants and needs the underlying to move beyond those breakevens while the short straddle wants and needs the underlying to not move and to stay between those breakevens. Let's figure the same likelihood for the other straddles we've already looked at and some additional straddles on other underlyings. We see these likelihoods in Table 7.2.

Wow, the odds of the underlying stocks getting past a breakeven is always very close to 43 percent. One of those straddles only had 3 days to expiration, one had 60 days to

TABLE 7.2 **Breakeven Points for the Straddles We've Examined and Some Others**

Straddle	Lower Breakeven Point	Delta of the Lower Breakeven Point	Upper Breakeven Point	Delta of the Upper Breakeven Point	Combined Delta, Likelihood Long Straddle Is Profitable
Biotech stock 21 strike (60 days to expiration)	16.15	15	25.85	28	43
SPY 170 strike (3 days to expiration)	167.44	21	172.56	22	43
International bank 49 strike (30 days to expiration)	46.00	20	52.00	23	43
Troubled technology company 8 strike (38 days to expiration)	6.71	17	9.29	25	42
Global restaurant chain 94 strike (23 days to expiration)	90.58	20	97.42	22	42

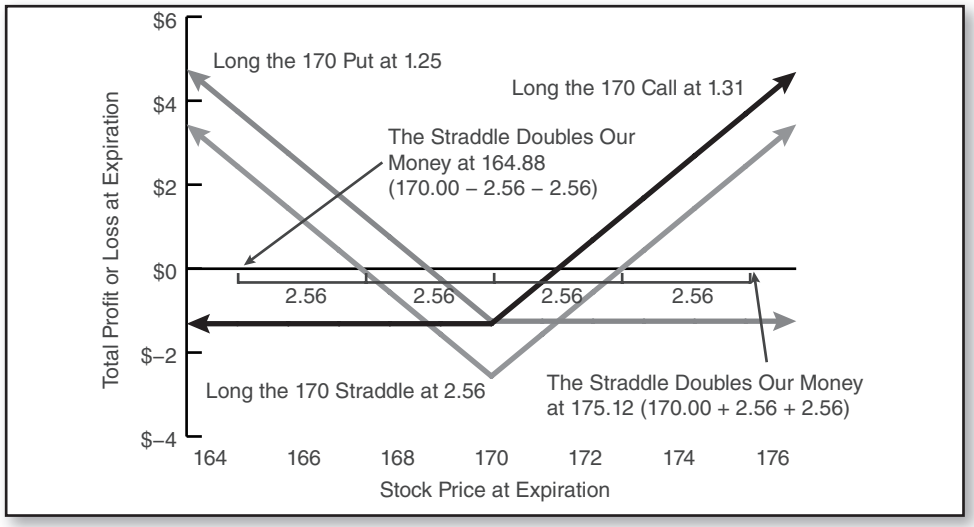


FIGURE 7.10 Doubling Our Money with a Straddle in SPY

expiration and one was in between with 30 days to expiration. The biotech stock had a very high implied volatility, as those stocks tend to display. SPY had a moderate implied volatility. Is there something about a straddle that makes that 43 percent value consistent? Yes.

As implied volatility goes up the option price goes up as well but an out-of-the-money option (like our theoretical options with strike prices equal to the breakeven prices) sees its delta increase as implied volatility increase, everything else remaining the same.

We see that the odds of a long straddle getting to one of the breakeven points are pretty slim; they're less than 50 percent. And just getting back to breakeven doesn't do us much good; we're trading options to make money or to reduce risk, not to break even, and a long straddle doesn't reduce our risk very much. Let's do the same sort of analysis using option delta to find the likelihood of a long straddle making a reasonable amount of money, say earning what we were risking. We see this in Figure 7.10.

We see in Figure 7.10 that the underlying has to drop to 164.88 or rally to 175.12 at expiration in order to generate a profit equal to the cost—and the risk—of the straddle of 2.56. What is the likelihood of getting to either of those "doubling points"? The delta of the hypothetical put with a strike price of 164.88 was 5 (the odds of the underlying being below 164.88 at expiration were 5 percent). The delta of the hypothetical call with a strike price of 175.12 was 6 (the odds of the underlying being above 175.12 were 6 percent). That means the odds of at least earning what we were risking was only 11 percent (5 percent + 6 percent). Not very good odds.

But the maximum profit from a long straddle is huge if the stock drops and infinite if the stock rallies. So what are the odds of hitting a home run and generating a return that is at least 5 times what we risked? What are the odds of our trade generating a profit of at least 12.80? That would require SPY to be below 157.20 or above

182.80 at option expiration. If we do the same delta calculations, we find that the odds of SPY being below 157.20 are 0.00130 percent. The odds of SPY's being above 182.80 are 0.00587 percent. The odds of this straddle generating a return of 5 times our initial investment of 2.56, a return of at least 12.80, is 0.00717 percent, meaning we'd expect to return 5 times our investment about once every 14,000 times we put the trade on. That said, don't rush out and start selling straddles. As option traders like to say, that's a great way to get rich slowly and go broke quickly because a move like that will occur and the option math says they occur more frequently than standard option models predict. So, what is a logical way to sell straddles?

Selling Covered Straddles

Buying a straddle is a tough way to make money, the odds of the underlying just getting to one of the breakeven points is low. The odds of making money are even lower. The odds of making a lot of money are lower still. But blindly selling straddles is one of those option strategies that works until it doesn't, and then it really gets ugly. Is there a good way to sell straddles? There is: selling covered straddles.

In selling a covered call we own stock and sell calls against that stock. The risk inherent in the short call is covered by the ownership of the stock. Even if the stock appreciates infinitely the risk for our short call is covered because we own the stock. We may regret selling the call or we may sell the stock at an effective price that is higher than the stock ever traded but even if that effective price is lower than the current market price, we know that we'll have effectively sold our stock at a price higher than was available when we sold the call. And if the stock goes down or sideways, then we pocket the call premium received and we still own our stock.

In selling a covered put, that is a put that is covered by enough cash to buy the stock at the strike price if it's put to us, we collect the premium that any option seller collects. If the stock moves sideways or up, and even if it moves down a little if our put was slightly out-of-the-money at initiation, we won't have the stock put to us, yet we'll keep the premium received and still have all our cash. If the stock moves down enough, then we'll have the stock put to us but we might buy it at an effective price lower than the stock ever actually traded. And if we regret buying the stock because the effective purchase price is higher than the current market price? Well, we bought the stock at an effective price that is lower than was available when we sold the put.

What if we were to combine a covered call and a covered put such that the call and put had the same strike price and expiration? That would be a covered straddle.

You might own stock that you think is fairly valued but if the price went up you'd be willing to sell some and if the price went down you'd be willing to buy more because you may not own as much as you'd like. One way to make certain you do one of those is to sell a covered straddle. How can we be certain we'll do one of those? Because unless the underlying stock closes precisely at the strike price, to the penny, on expiration, one of

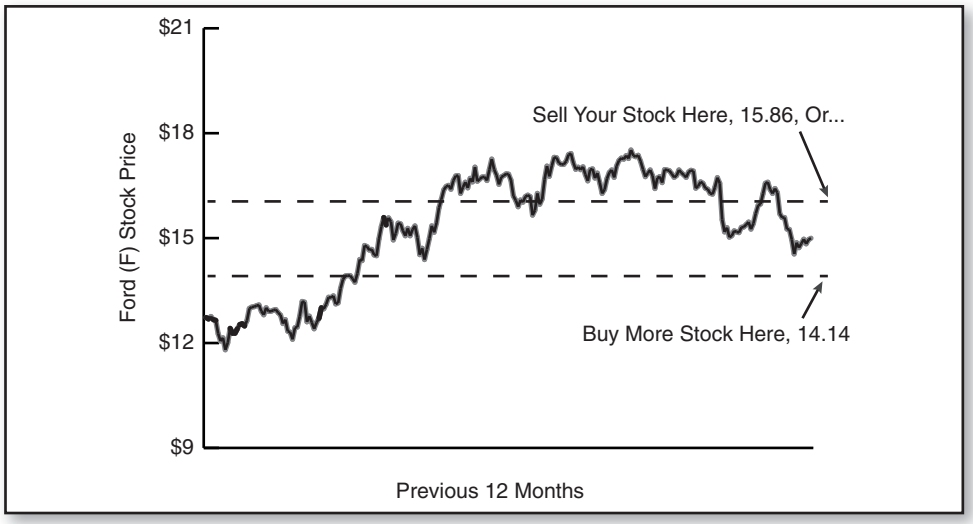


FIGURE 7.11 Stock Chart of Ford for Our Covered Straddle

the options is going to be in-the-money and that option will be exercised. If the call is exercised, we're going to sell our stock at an effective price higher than the strike price and higher than where it was when we sold the straddle. If the put is exercised, we're going to buy more of the stock at an effective price lower than the strike price and lower than were it was when we sold the straddle. And if the underlying stock does the very unlikely and closes precisely at the strike price at expiration? Then we keep all of that option premium and our stock position is unchanged. Let's look at an example of a covered straddle in Ford (F), which was at 15.00. You can see a chart of Ford stock over the previous 12 months in Figure 7.11. Notice that it's in the middle of the range for that period.

If we owned Ford stock, we might think that we'd be willing to sell it if we could sell at an effective price of 15.80 or so since that's about a 5 percent premium to where the shares are trading now but we might be willing to buy more if we could pay an effective price of 14.20 or so since that's about a 5 percent discount to where shares are trading now. Figure 7.12 shows the options that we might use to construct a covered straddle.

If we sell this 15 strike covered straddle, we'll collect a total of 0.86, which is ours to keep. Since we're short a 15 strike covered call, if Ford is above 15.00 at option expiration, we're going to have our 100 shares called away and we'll be paid 15.00 for each of them, since that's the strike price of the call we're short. Since we're short a 15 strike covered put, if Ford stock is below 15.00 at option expiration, we're going to have another 100 shares put to us, and we'll pay 15.00 for them, since that's the strike price of the put we're short.

So we'll receive 15.00 for our shares if we're forced to sell them or we'll pay 15.00 for more shares if we're forced to buy them, but our effective price is aided by the 0.86 in straddle premium we collect. That means our effective sale price would

Strike Price	Option Type			
	Call			Put
12	3.03			0.02
13	2.06			0.04
14	1.14	Sell	Sell	0.13
15	0.44 ←	This &	This →	0.42
16	0.12	Call	Put	1.09
17	0.03			2.00
18	0.02			3.01

Selling the 15 Covered
Straddle at 0.86
(0.44 + 0.42)

The Resulting Covered Straddle Position

Long 100 Shares of Ford (F) at 15.00
Long $1,500.00 in Cash
Short One 15 Strike Call at 0.44
Short One 15 Strike Put at 0.42

Collecting a Total of 0.86

FIGURE 7.12 Selling a Covered Straddle in Ford

be 15.86 or our effective purchase price would be 14.14. Figure 7.13 shows the payoff at expiration for this position.

A covered straddle is similar to a covered call. In fact, it's a covered call plus a covered put, so that makes sense. Since a covered put is identical to a covered call, as we discussed in Chapter 5, a covered straddle is really like two covered calls.

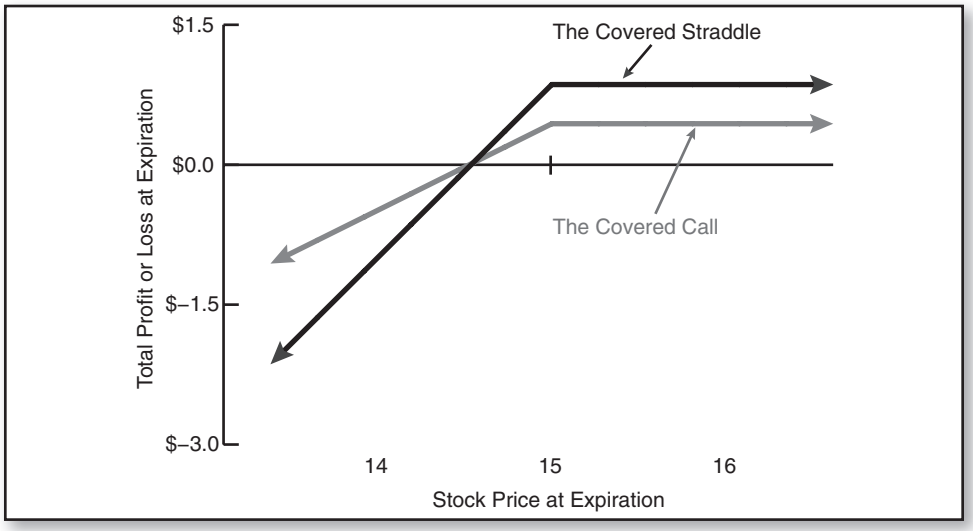
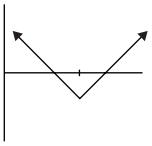
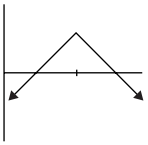


FIGURE 7.13 Payoff for a Covered Straddle in Ford

Straddle Cheat Sheet

	Long Straddle	Short Straddle
Description	Long ATM call, long ATM put	Short ATM call, short ATM put
Example	ATM = 100 Long 100 Call Long 100 Put	ATM = 100 Short 100 Call Short 100 Put
Pay or Collect Premium	Pay	Collect
Needed Directionality		
Passage of Time without Market Movement	– – – – –	+ + + + +
Increase in Implied Volatility without Market Movement	+ + + + +	– – – – –
Payoff Thumbnail Chart		
Maximum Risk	Cost of the straddle	Theoretically unlimited
Maximum Profit	Theoretically unlimited	Premium received
Breakeven Points	Strike price ± Cost of the straddle	Strike price ± Cost of the straddle

CHAPTER 8

Strangles

When we discussed straddles in Chapter 7, we described an option combination created by buying (or selling) a put and a call with the same strike price, usually the at-the-money strike price, and with the same expiration. Straddles are pretty expensive because to execute a long straddle you buy the two options that have the greatest amount of time value. If you're selling a straddle, that's good news; you're selling the two most expensive options, in terms of time value, in that expiration month, but you're pretty much assured of having one of your short options expire in-the-money, meaning you'll have a position in the stock, a position that you might not want.

If you wanted to make money if the underlying stock experienced a big move but didn't want to spend as much as a long straddle might cost, or if you wanted even more leverage than a straddle will generate, then you could buy out-of-the-money options; you could buy an out-of-the-money call, meaning that the strike price of the call is above the current price of the underlying stock, and you could buy an out-of-the-money put, meaning that the strike price of the put is below the current price of the underlying stock. This combination of an out-of-the-money call and out-of-the-money put with the same expiration date is a strangle. When buying both options we're buying the strangle, when selling both options we're selling the strangle.

A long strangle is a defined risk strategy that you might use when you expect a substantial move in the price of the underlying stock by the date of the options' expiration; the risk is limited to the total amount of premium paid. Unlike buying an outright option or a vertical spread, buying a strangle doesn't require us to get the direction correct. A big move either up or down will generate a profit for a long strangle. But big moves like the kind needed for a strangle to be profitable are rare.

Strangles can be much less expensive than straddles, and if options are substantially out-of-the-money, then our strangle will cost a tiny fraction of what a straddle

might cost. Like a straddle, we don't have to get the direction correct for our long strangle to be profitable, but as with a straddle, that comes at a cost. In a long strangle, at least one of our options will expire worthless, and if we don't see a big enough move, then both may expire worthless, meaning we lost all the premium we paid for our strangle. A long strangle is a blunt instrument because we don't have to get the direction correct but it can be a low cost, on an absolute basis, blunt instrument.

Conversely, a short strangle has a high likelihood of generating a profit, but the maximum potential profit is the total amount of option premium received and the maximum potential loss is theoretically unlimited if the underlying stock were to rally. The maximum potential loss if the stock were to drop is limited only by the fact that the price of the stock can't drop below zero.

A long strangle is a highly leveraged trade in that a relatively small amount of money spent to buy the strangle can result in profits that are many times the cost of the trade. But that leverage comes at a cost—the likelihood of a strangle being profitable is small. The likelihood of a strangle being very profitable is very small.

Let's look at some options on a stock that might experience a big move, Blackberry (BBRY). At the time, it was thought that Blackberry might rally substantially if they could agree to a strategic partnership with another smartphone maker, and it was thought that BBRY could drop substantially if their business continued to deteriorate or if the next earnings release was disappointing. BBRY was at 10.49 when these option prices were observed. Since earnings are a potential catalyst, we'll look at options that capture the next earnings announcement. You can see this in Figure 8.1.

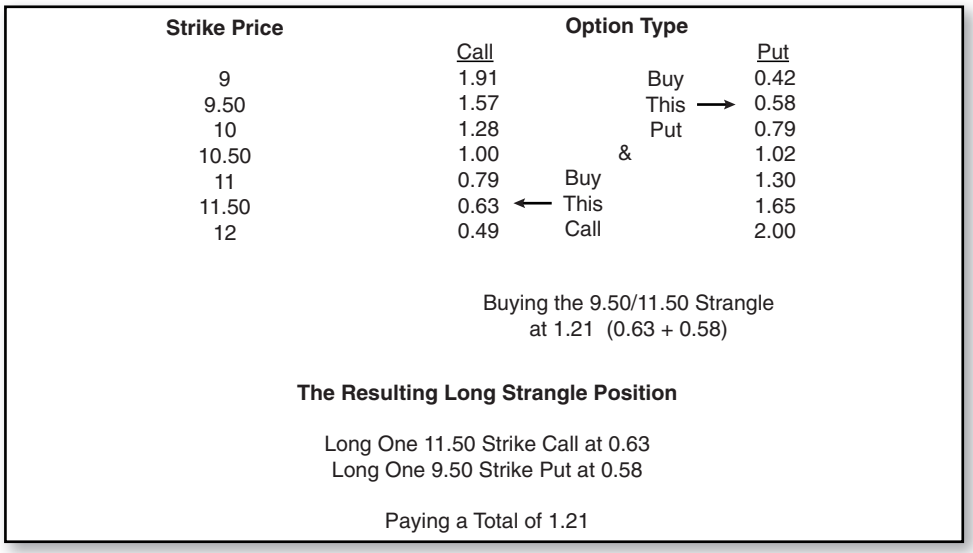


FIGURE 8.1 Buying a Strangle in Blackberry (BBRY)

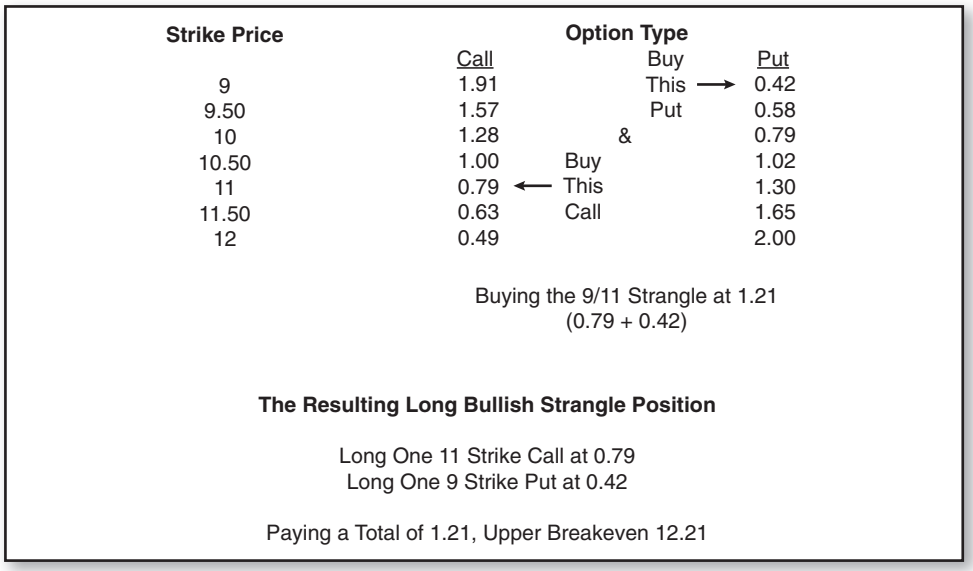


FIGURE 8.2 Buying a Bullish Strangle in Blackberry (BBRY)

There are seven strike prices in Figure 8.1, so we could use many different combinations to create our strangle. If we used the 10.50 call and the 10.50 put, we would have bought a straddle rather than a strangle, since the two options would share a strike price. Strangles use out-of-the-money options, so we'll look at the 9.50/11.50 strangle, which we could buy for 1.21. There are other out-of-the-money options we could combine to create a strangle. The two options making up our 9.50/11.50 strangle are about equidistant from at-the-money, that is, from the current stock price of 10.49. There's no rule that your strike prices have to be equidistant from at-the-money. Figure 8.2 shows a bullish strangle in BBRY that you might execute if you thought the company was going to recover and the stock was going to rally. Notice that this bullish strangle cost precisely the same 1.21 that the original strangle did but now the upper breakeven point is only 12.21 rather than the original 12.71.

Figure 8.3 shows a bearish strangle in BBRY that you might execute if you thought the company's stock price was going to continue lower. The bearish strangle cost 1.28, but only 0.07 more than both our original strangle and the bullish strangle, and the lower breakeven is now 8.72 versus the original lower breakeven of 8.29.

If both of the options from our strangle were in-the-money, buying the 9 strike call and buying the 12 strike put, for example, that would be a structure called a *guts*. Guts are very rarely used, even by professional traders. One reason they're rare is the impact of the bid/ask spread on your trade execution of in-the-money options.

We might think BBRY could make a big move, but the market thinks that as well, so these options are very expensive in the term that matters: implied volatility. Since

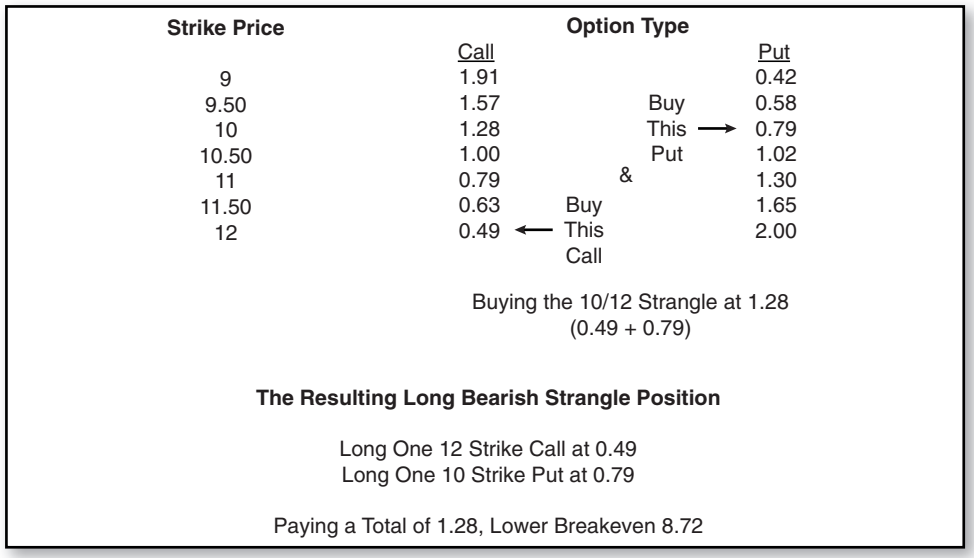


FIGURE 8.3 Buying a Bearish Strangle in Blackberry (BBRY)

we're buying the 9.50/11.50 strangle in BBRY, we're limiting our risk to the 1.21 that we pay. but that's a lot for a $10.50 stock. We'll realize that maximum loss if BBRY doesn't drop below 9.50 or rally above 11.50 by expiration. The strike prices of the options that make up our long strangle are the inflection points; above and below these strike prices, our long strangle loses less than the maximum possible. Our potential profit is essentially unlimited if BBRY were to rally, although there's a practical limit to the amount by which BBRY could rally during the term of our strangle. Our potential profit if BBRY were to drop is limited only by the fact that the stock can't drop below zero. That means our maximum potential profit to the downside is 8.29, which is the put strike price, 9.50, less the cost of the strangle. Let's connect the dots again to see the payoff chart for our long BBRY 9.50/11.50 strangle. You can see this in Figure 8.4.

Obviously our long strangle in BBRY needs Blackberry stock to move a lot, we need it to be very volatile. We need a move of nearly 10 percent in either direction to get to one of those inflection points where we don't lose the maximum possible. We need a move of over 20 percent just to get to breakeven. We know we can use the tools at www.OptionMath.com to calculate the likelihoods of these levels being reached. Let's look at Table 8.1 to see what those likelihoods are.

Those deltas tell us that reaching those profit levels is pretty unlikely and there's a 29 percent (100 percent – 30 percent – 41 percent) likelihood that we'll lose the entire 1.21. That might be because we picked strike prices that were so far from at-the-money. What if we picked the strikes that are as close to at-the-money as possible? That would be the 10/11 strangle and it would cost 1.58 (0.79 to buy the

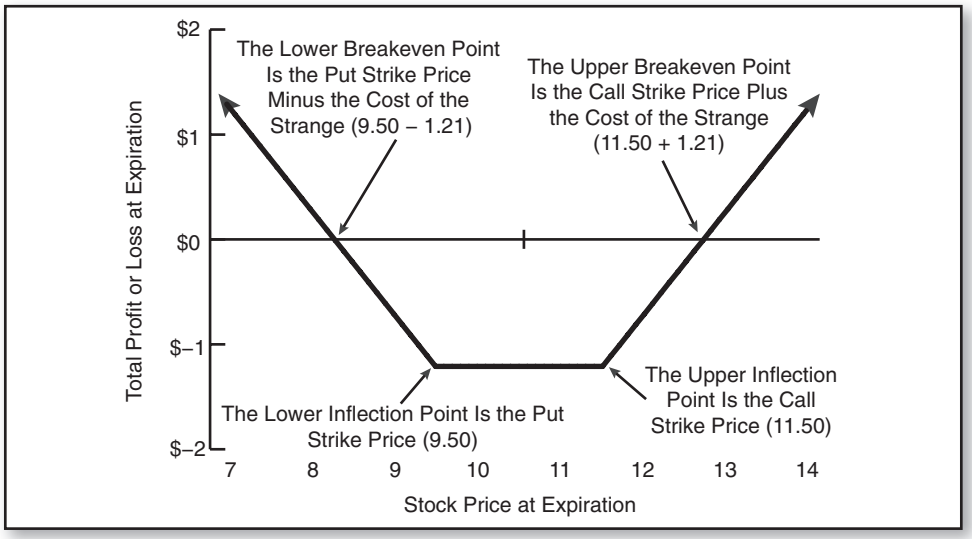


FIGURE 8.4 The Payoff for Our Long 9.50/11.50 Strangle in Blackberry (BBRY)

TABLE 8.1 **Important Likelihoods for Our BBRY Strangle**

Outcome	Profit or Loss	Move Required	Likelihood (Delta)
Reach lower inflection point (9.50)	–1.21	9.4%	30%
Reach upper inflection point (11.50)	–1.21	9.6%	41%
Reach lower breakeven point (8.29)	0	21.0%	15%
Reach upper breakeven point (12.71)	0	21.1%	27%
Profit to downside by amount risked (7.08)	1.21	32.5%	5%
Profit to upside by amount risked (13.92)	1.21	32.7%	16%

11 strike call and another 0.79 to buy the 10 strike put). Let's look at Table 8.2 to see what the outcomes would be for that strangle.

The likelihood of reaching one of the inflection points such that we don't lose the maximum amount is greater; the likelihood of losing the maximum amount for this strangle is only 15 percent. But the likelihood of getting all the way to breakeven is only 44 percent and the likelihood of generating a profit at least equal to the amount risked is actually lower than it was with our 9.50/11.50 strangle.

The fact that BBRY options are so expensive and that the stock price and hence the put strike prices for any strangle we might consider are relatively close to zero distorts some of the relationships for our strangle. Let's look at some strangles on Google (GOOG) since that stock price, and hence those put strikes, are going to be a long way from zero, but rather than listing all of the

TABLE 8.2 Important Outcomes for a Narrower Strangle in BBRY

Outcome	Profit or Loss	Move Required	Likelihood (Delta)
Reach lower inflection point (10.00)	–1.58	4.7%	37%
Reach upper inflection point (11.00)	–1.58	4.9%	48%
Reach lower breakeven point (8.42)	0	19.7%	16%
Reach upper breakeven point (12.58)	0	19.9%	28%
Profit to downside by amount risked (6.84)	1.58	34.8%	4%
Profit to upside by amount risked (14.16)	1.58	35.0%	15%

options available and picking a strangle, let's look at how the likelihoods change as the strangle gets wider and the legs get further from at-the-money. You can see this in Figure 8.5.

The cost of the strangle increases as the strangle gets narrower. This makes sense because the width of the strangle is decreasing as both options are getting closer to at-the-money, and thus both options are getting more expensive. The interesting aspect of this chart is that the odds of having the strangle breakeven are at their maximum with the strangle as narrow as possible and the odds of breaking even decrease as the width of the strangle increases, that is, as the strikes get farther from at-the-money. Unfortunately, the narrowest strangle may be the one that's most likely to break even, but it's also the one that's most expensive. With GOOG very close to 1,200.00, the 1,195/1,205 strangle cost over 73.00. That means a single strangle

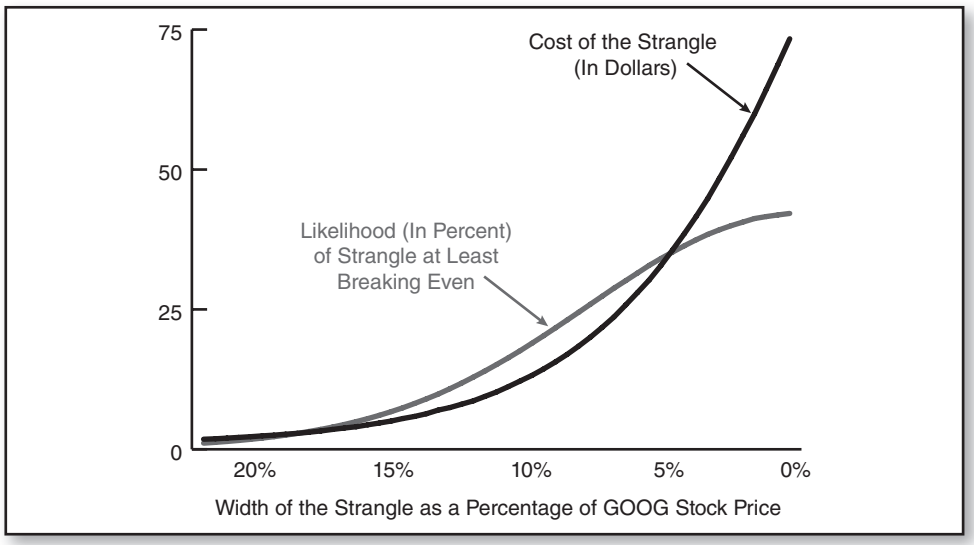


FIGURE 8.5 The Cost of Our Google Strangle versus the Likelihood of Breaking Even

would require an outlay of over $7,300.00. Much of that is due to the fact that stocks with high absolute prices, such as GOOG at 1,200.00, have high absolute option prices. But, regardless, the strangle that is going to enjoy the highest likelihood of at least breaking even is going to be the most expensive strangle in absolute terms.

The strangle that cost the least may not require us to pay much but the odds of it breaking even are pretty small. Sometimes they get really small, as we saw in Table 8.1.

So why would anyone buy really cheap strangles meaning strangles that are quite a bit from at-the-money in relative terms? Because out-of-the-money strangles may rarely break even, but they generate enormous leverage. We've looked at strangles on a really cheap stock in BBRY. We've looked at strangles on a really expensive stock in GOOG. Let's look at the leverage that strangles can generate, but let's look at a reasonably priced stock or exchange-traded fund (ETF). EEM is the emerging-market ETF, and on the day the option prices in Figure 8.6 were observed, EEM was at 39.43.

Let's assume that we create some strangles from these available options and that each leg is about equidistant from the 39.43 at-the-money price. What would each strangle cost and what profit or loss would each strangle generate if EEM moved by 10 percent during the term of these options? We see this in Table 8.3. Since these are strangles, the only reason it matters whether the move is up or down is that the legs of our strangles aren't exactly equidistant from 39.43.

These strangles all exhibit tremendous leverage. Some of them could return as much as 3 times the initial cost of the trade given a 10 percent move, and they didn't require getting the direction correct. But as we've seen before, the odds of that sort of move are really small.

Strike Price	Option Type	
	Call	Put
36	3.60	0.18
36.50	3.13	0.22
37	2.69	0.28
37.50	2.26	0.35
38	1.86	0.45
38.50	1.49	0.58
39	1.15	0.75
39.50	0.86	0.95
40	0.62	1.21
40.50	0.42	1.51
41	0.27	1.86
41.50	0.17	2.27
42	0.10	2.70
42.50	0.06	3.15
43	0.04	3.63

FIGURE 8.6 Options for a Strangle in EEM, the Emerging-Markets ETF

TABLE 8.3 Strangles and Leverage

Strangle	Cost	Net Profit with 10% Move Down	Leverage
36/43	0.22	0.29	132%
36.50/42.50	0.28	0.73	261%
37/42	0.38	1.13	297%
37.50/41.50	0.52	1.49	287%
38/41	0.72	1.79	249%
38.50/40.50	1.00	2.01	201%
39/40	1.37	2.14	156%

Selling Strangles

Selling strangles is a defined-profit, unlimited-risk trade that collects the premium from simultaneously selling an out-of-the-money call and an out-of-the-money put.

Since the likelihood of the sort of move required to generate a profit for a strangle is so rare, you might think that selling strangles would be a great way to collect some option premium without much risk. Strangles are like straddles in that professional option traders consider consistently selling strangles to be a great way to get rich slowly and go broke quickly. That's because these expected likelihoods of certain outcomes tend to underestimate the likelihood of extreme events over time. That's due to both the way markets actually operate and some of the assumptions made by option pricing models. This means that the sort of move that would bankrupt a strangle seller is more likely than you think it is and it's actually more likely than the delta we calculate would have us think. It's not possible to see it coming since these are often external events that are geopolitical or financially systemic in nature rather than simply economic.

But if you're committed to selling a strangle, let's look at some options on Facebook (FB) that we might use to construct our short strangle. You can see these options in Figure 8.7.

By selling this 67/70 strangle in FB, we collect a total of 4.75. That 4.75 is ours to keep no matter what. This short strangle will profit by that 4.75 if FB is between the two strike prices, 67 and 70, at expiration; the lower breakeven is 62.25 (67.00 – 4.75) and the upper breakeven is 74.75 (70.00 + 4.75). You can use the tools at www.OptionMath.com to determine the deltas for all four points, the two inflection points and the two breakeven points, to know what the market currently says about the likelihood of getting to those points.

Figure 8.8 connects all the dots and shows the payoff chart we're familiar with.

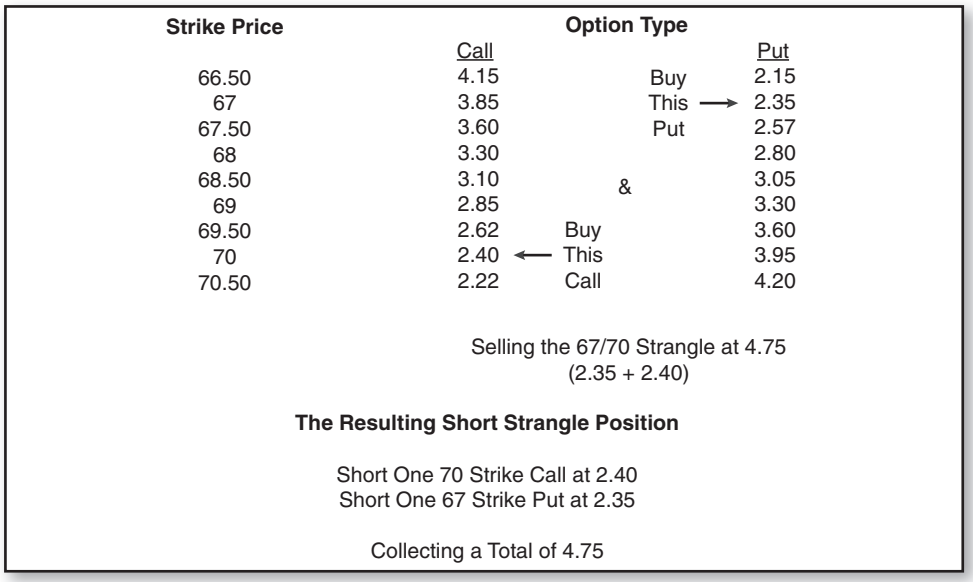


FIGURE 8.7 Selling a Strangle in Facebook (FB)

You'll notice that the chart keeps moving down, representing losses, as the underlying stock price falls. You'll also notice that the chart keeps moving down, again representing losses, as the underlying stock price rallies. A short strangle has theoretically unlimited losses if the underlying stock rallies and the loss if the stock drops is limited only by the fact that the underlying stock can't drop below zero. Regardless, a short strangle is a speculation that the underlying stock will experience low volatility during the term of the strangle.

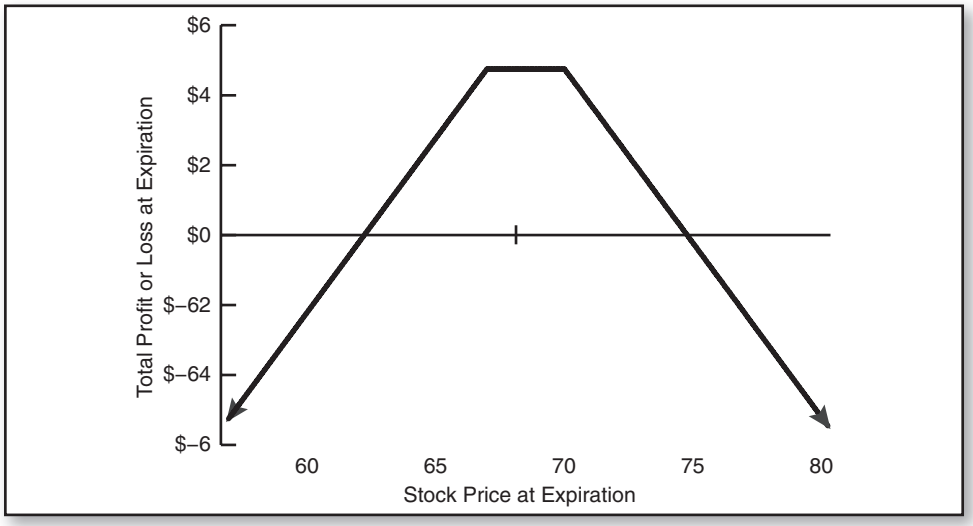


FIGURE 8.8 The Payoff for Our Short Strangle in Facebook (FB)

Selling Covered Strangles

Is there any way to define or limit the risk of a short strangle if we wanted to collect that premium? Well, you could sell this strangle and simultaneously buy a wider strangle and this long strangle would limit your risk but those options that are substantially out-of-the-money, the options that we might buy to define our risk, are usually very expensive in relative terms. This spread, created by buying one strangle and selling another narrow strangle, is very much like selling an iron condor, which we'll discuss more in the Chapter 12. Is there another way to define our risk, or at least be certain that we can bear the risk, without buying those expensive, far out-of-the-money, options?

We could sell a strangle on stock that we already own and that we'd be willing to sell above the current stock price while being willing to buy more at a price below the current stock price. We would sell an out-of-the-money call that is covered by ownership of the underlying stock, and we would sell an out-of-the-money put that is covered by cash equal to the price we'd have to pay for the stock if it was put to us at expiration. This combines a covered call and a covered put and would be a covered strangle. In Chapter 7, we looked at a covered straddle on Ford (F). Let's look at those same option prices and see if we wouldn't want to sell a covered strangle in Ford. You can see those prices in Figure 8.9.

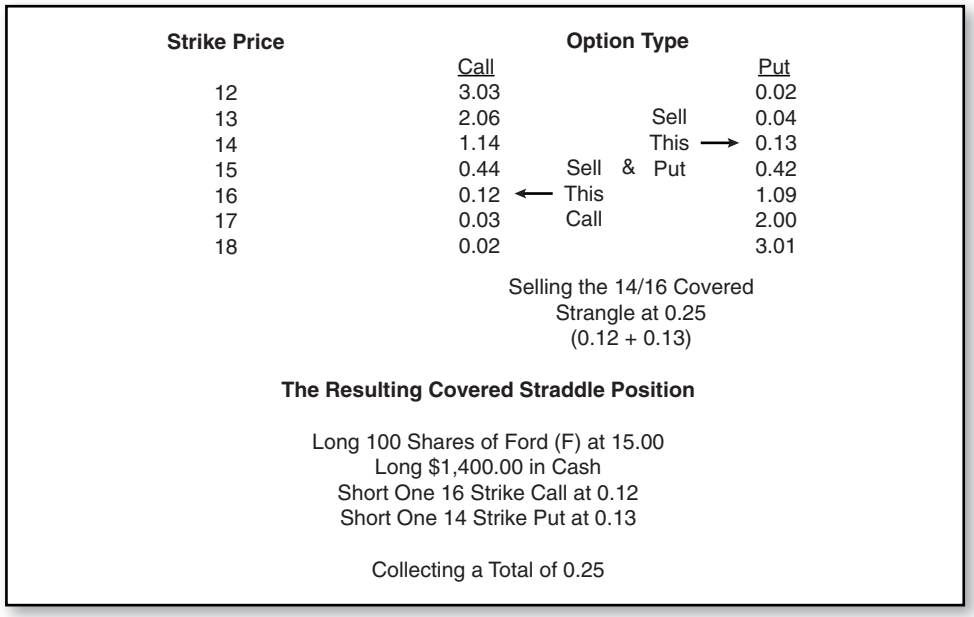


FIGURE 8.9 Selling A Covered Strangle in Ford

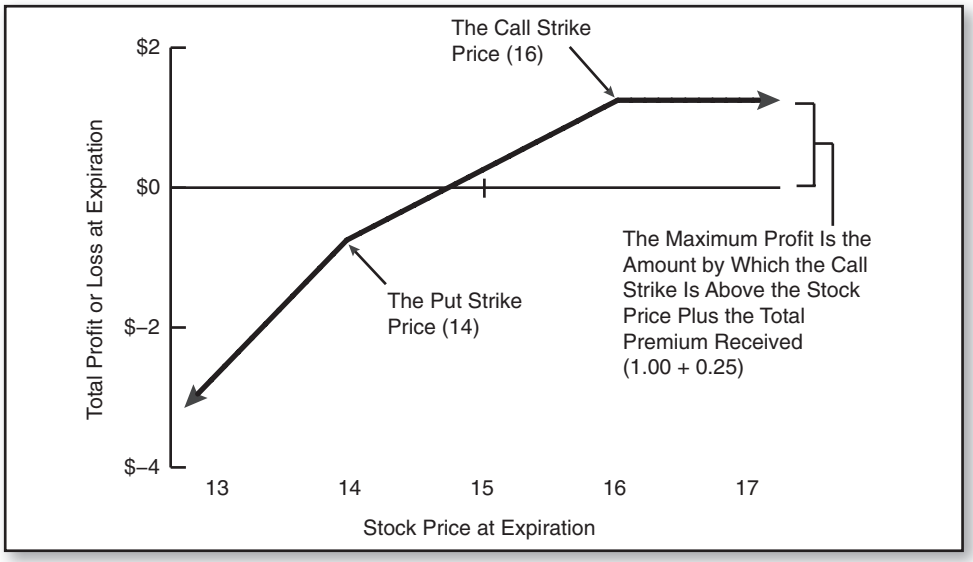


FIGURE 8.10 The Payoff for Our Covered Strangle in Ford

This strangle only collects 0.25 but that's largely a function of the fact that Ford stock at 15.00 is cheap in dollar terms. That 0.25 is 1.7 percent of the cost of Ford stock, so it's not nothing. If we could sell a covered strangle each month and profit by 1.7 percent each time, we'd have a total profit of 22 percent at the end of the year.

As long as Ford is above 14.00 and below 16.00 at option expiration, the options we're short will expire worthless, our potential duty to deliver our shares or buy more stock will be extinguished, and we can reexamine the fundamentals to determine our next step. Let's look at the payoff chart for this covered strangle (Figure 8.10).

One of the benefits of covered strangles is that we can collect that option premium in exchange for selling our stock at an effective pay that we'd be happy to receive or for buying more stock at an effective price we'd be happy to pay. With our original covered straddle in Ford we would sell our stock at an effective price of 15.86 and we would buy more at an effective price of 14.14. With our covered strangle our effective selling price, if our stock were called away, would be 16.25, and our effective purchase price would be 13.75 if we had additional stock put to us. The trade-off for those more attractive effective prices? We only collect 0.25 in total option premium versus the 0.86 the covered straddle collected. But let's look at the Ford stock chart again and see how our new effective prices look in comparison to the old effective prices generated by our covered straddle. You'll see this in Figure 8.11.

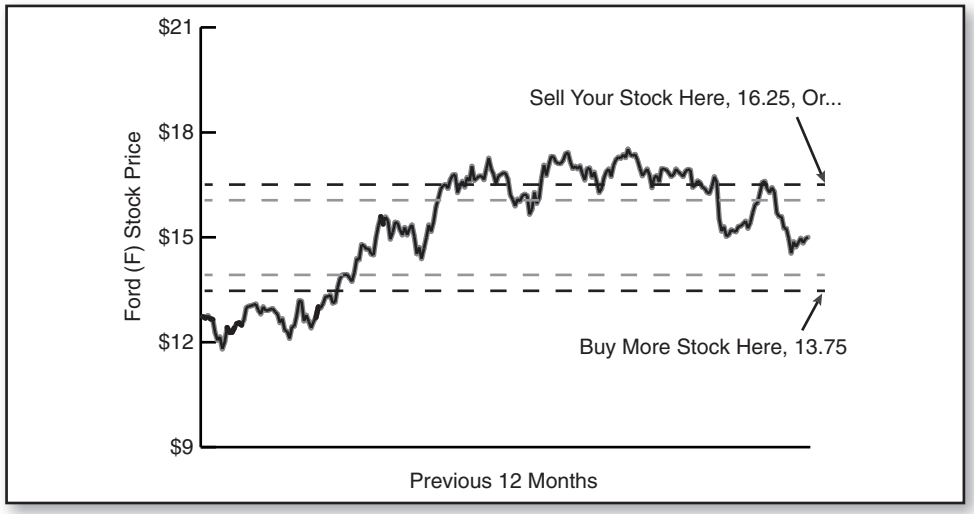
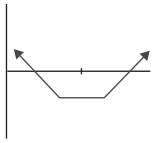
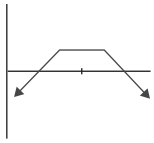


FIGURE 8.11 The Stock Chart of Ford and Our Effective Prices

If you'd truly be happy selling your stock at 16.25 or buying more at 13.75, then selling a covered strangle and collecting 0.25 that you get to keep regardless may seem like a "must do" trade, but anyone who has more stock put to them or has their stock called away and regrets having either of those happen because the stock is well through their effective price has to be disciplined enough to remember why they executed the trade originally.

Strangle Cheat Sheet

	Long Strangle	Short Strangle
Description	Long OTM call, long OTM put	Short OTM call, short OTM put
Example	ATM = 100.00 Long 105 call Long 95 put	ATM = 100 Short 105 call Short 95 put
Pay or Collect Premium	Pay	Collect
Needed Directionality		
Passage of Time without Market Movement	– – – –	+ + + +
Increase in Implied Volatility without Market Movement	+ + + +	– – – –
Payoff Thumbnail Chart		
Maximum Risk	Cost of the strangle	Theoretically unlimited
Maximum Profit	Theoretically unlimited	Premium received
Breakeven Points	Call strike price plus cost of the strangle Put strike price minus cost of the strangle	Call strike price plus cost of the strangle Put strike price minus cost of the strangle

CHAPTER 9

Collars

We saw in Chapter 4 that a covered call generates premium that we get to keep and that call premium provides a little downside protection. The downside protection isn't infinite; it stops when the option premium received has been exhausted by the drop in the stock price. What if we wanted or needed more downside protection? We might think instead about buying a put option but we'd have to pay for that put option. If we sold a covered call and then used the premium received to buy that protective put, we could get the sort of protection we want but without paying much, if any, net premium. This combination of long stock, a covered call, and a long put is a *collar*. The two options will have the same expiration date but will have different strike prices, with the strike price of the covered call generally above at-the-money and certainly higher than the strike price of the protective put, which will generally be below at-the-money (if the options had the same strike price we would have constructed a conversion; see Chapter 13 for more on conversions).

Since a collar is short a covered call, there's an upper limit to how high the underlying stock can rally before getting called away, meaning there's an upper limit to the effective price we could receive for the stock and an upper limit to the value of the complete collared position. A collar is also long a protective put, so there's a lower limit on how much we would receive for our stock and a lower limit to the value of the complete collared position. This band, or collar, of possible outcomes with a cap defined by the covered call and a floor defined by the put gives the option collar its name.

A collar is a defined risk strategy in that there is a floor to the effective price we'd collect for selling our stock if it was below the put strike at expiration but it's also a limited profit strategy in that there is a cap on the effective price we'd collect for selling our stock if it was above the call strike price at expiration.

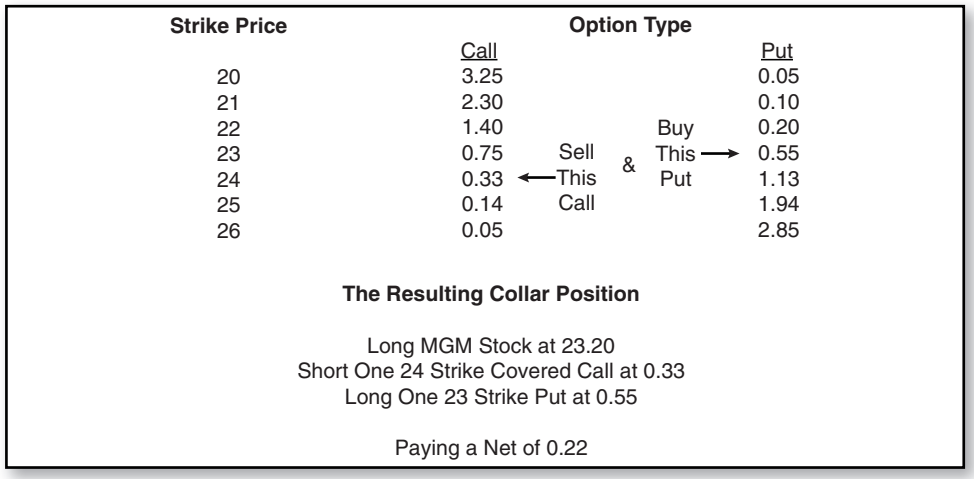


FIGURE 9.1 An Option Collar on MGM

Often, a stock is collared after it has shown substantial gains. Collaring newly purchased shares doesn't make much sense for reasons that we'll discuss when discussing "zero cost" collars.

Figure 9.1 shows some options on MGM and one collar we might construct.

Since we show seven strike prices and each strike price has both puts and calls, there are dozens of potential combinations that would result in a collar. But we'll focus on those collars that have the call struck higher than the put with both being out-of-the-money when the trade is initiated. MGM was at 23.20 so the tightest collar would be the 23/24 collar, meaning we'd be long MGM stock, we'd be short a 24 strike covered call at 0.33 and we'd be long a 23 strike protective put at 0.55. Generally, a collar is initiated against an existing stock position, so we could be long MGM from nearly any price, but we'll use the current price, 23.20, for profit and loss purposes, which is appropriate because that's where it's at now (and you're only long stock from the current price since you've made a decision, either overtly or not, to stay long the stock at the current price), and if MGM were trading at any other price, these options would be trading at other prices.

The put portion of this collar, the 23 strike put, was more expensive than the 24 strike call so this collar would cost us money to execute. We would only collect 0.33 for selling that covered call, but the put would cost us 0.55, meaning the collar would cost a net of 0.22. What would the profit and loss for this stock and collar position look like? You can see that in Figure 9.2.

The maximum loss on the collared stock is 0.42, and that is realized with MGM at or below the 23 strike. While we experience a loss, the long put limits the loss to that 0.42 no matter how far MGM stock falls. We would experience this loss of

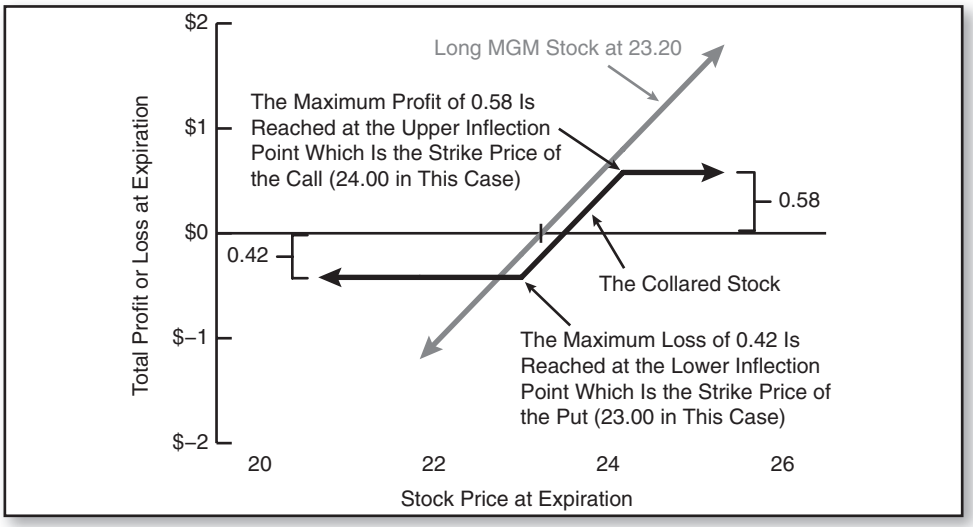


FIGURE 9.2 Payoff for the 23/24 Collar in MGM

0.42 because with MGM at or below 23.00 at expiration, we would lose 0.20 on our stock (23.20 – 23.00) plus 0.22 (0.55 – 0.33), the collar cost to execute.

The maximum profit on the collared stock position is 0.58 and that is realized with MGM at or above the strike price of the covered call, 24 in this case. Above that call strike price, the stock keeps appreciating, but the covered call offsets all of that appreciation. We would make 0.58 because we would have made 0.80 on our stock (24.00 – 23.20), but the collar cost 0.22.

What would the payoff chart look like if we had selected options that would have generated either no net premium or a slight credit? We could have sold the same covered call, the 24 strike, for 0.33 but gone further out-of-the-money when selecting which put to buy, going further down the available strikes until we had reached a put that could be purchased for the call premium received. That first put would be the 22 strike put, which could be purchased for 0.20, leaving 0.13 as a net credit that we get to keep no matter where the stock is at expiration. What would that chart look like? Would the payoff chart look substantially different? You can see that in Figure 9.3.

The 22/24 collar isn't substantially different from the 23/24 collar we looked at initially. In fact, this general shape for the payoff of the collared stock will exist regardless of the precise strike prices selected. The two important things to note are, first, that the maximum potential profit (0.93 in this case) plus the maximum potential loss (1.07) equal the distance between the two strike prices (2.00) and second, between the inflection points; that is, between the strike prices (22 and 24 in this case), the collared position will be above (more profitable than) the stock position

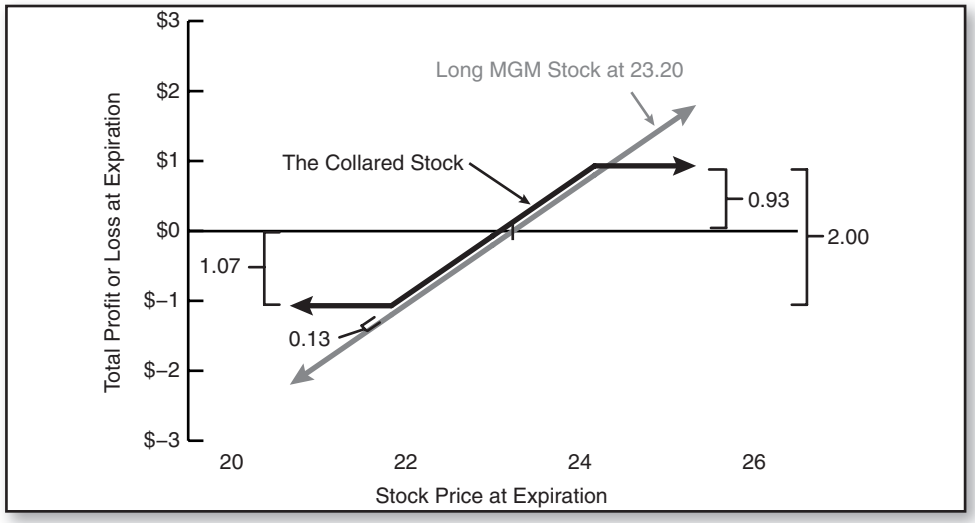


FIGURE 9.3 Payoff or the 22/24 Collar in MGM

by the amount of the net credit received if the collar generates a net credit (0.13 in this case) and will be below (less profitable than) the stock position by the amount of the net debit if the collar was executed at a net debit as it was with our 23/24 collar. In the lower left of Figure 9.3, you can see that if MGM is between the strike prices at expiration, the collared stock payoff is above that of the naked stock by the 0.13 of net premium collected.

Wider Collars

The very first MGM collar we looked at was as narrow as possible; the difference between the strike prices was only $1 and MGM options were struck $1 wide. If we were willing to take more downside risk in exchange for more upside potential, we might execute a wider collar. The widest collar we could execute in MGM given the options that were trading would have been the 20/26 collar. We would collect 0.05 for selling the 26 strike call, and we would use that 0.05 to buy the 20 strike protective put. The net would be zero, so this would be called a "zero-cost" collar. We'll discuss zero-cost collars in more depth later in this chapter.

This 20/26 is the widest we could construct, and protection wouldn't kick in until MGM had dropped from 23.20 to 20.00. In exchange for taking that additional risk, our stock isn't called away until MGM has rallied to 26.00. What would the payoff chart for this collar look like? Again, the general payoff shape is identical to the other collars we've looked at. The only differences are the potential profit, potential loss, and where those payoffs are realized. You can see this in Figure 9.4.

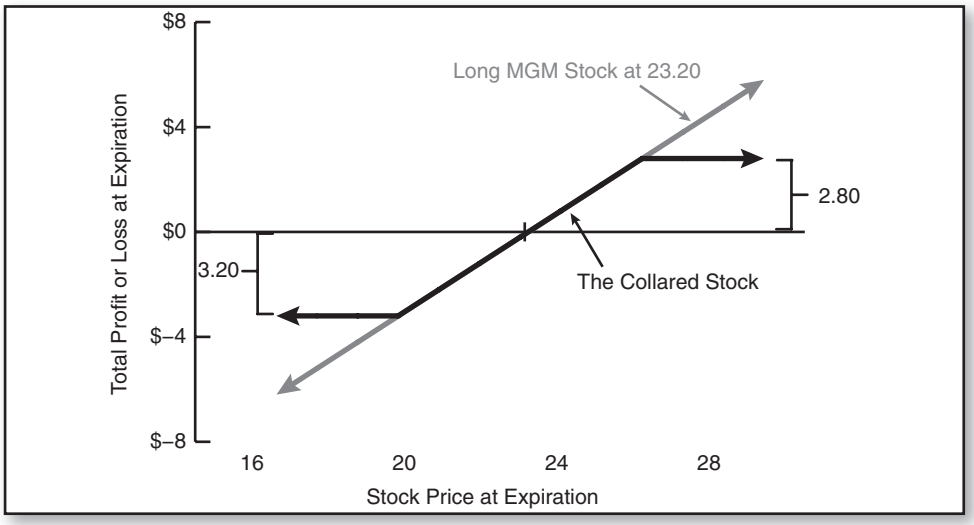


FIGURE 9.4 A Wider Collar in MGM That's Also a Zero-Cost Collar

Since these strike prices are so far out-of-the-money, the likelihoods of actually getting protection from the put or having our stock called away are pretty remote. This is the real difference between this wide collar and those narrower collars we looked at previously. Let's calculate the likelihoods of needing that protection or getting called away for both the 23/24 collar and for the 20/26 collar. You can use the tools at www.OptionMath.com to calculate the deltas we see in Table 9.1.

As you can see, the odds of the 20/26 collar actually coming into play at expiration are only 12 percent. This collared position will really act as if the stock wasn't collared unless there is a substantial move up or down. Whether you use a narrower collar that's likely to come into play like the 23/24 collar, which had a likelihood of 77 percent of your putting your stock via exercise or having your stock called away, or a wider collar like this 20/26 collar depends on your appetite for risk and your expectations for the underlying stock.

TABLE 9.1 Outcomes for Our Collars in MGM

Measure	23/24 Collar	Likelihood	22/24 Collar	Likelihood	20/26 Collar	Likelihood
Maximum profit (stock at or above call strike at expiration)	0.58	33%	0.93	33%	2.80	7%
Maximum loss (stock at or below put strike)	0.42	44%	1.07	22%	3.20	5%

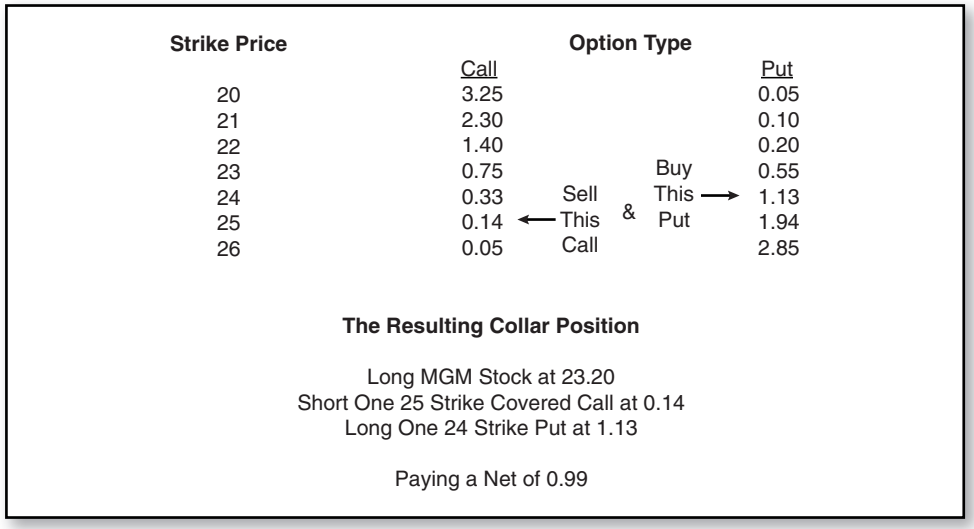


FIGURE 9.5 An In-the-Money Collar on MGM

In-the-Money Collars

What if we wanted to make certain that we lost less money on our collar? We might choose a put option that was struck in-the-money. The general shape of the payoff chart shouldn't change, but let's see if the collared stock position is going to be above or below the payoff of the naked stock, and let's see where the inflection points are. Figure 9.5 shows the same MGM options that we looked at earlier but constructs a different collar.

The protective put in this collar, the 24/25 collar, is struck in-the-money since MGM was at 23.20. The collar can still lose money, but the maximum loss is 0.19, and that occurs with MGM below 24.00 at expiration. Since MGM is at 23.20 now, this collar actually requires our stock to rally or it will lose money because we had to pay 0.99 to put the collar on. If MGM doesn't rally to 24.00, this collared position will lose money.

As you can see in Figure 9.6, this in-the-money collar trails the naked stock over a big range and underperforms the naked stock by the 0.99 net debit paid as long as MGM is above 24.00 at expiration. Below 24.00, the collar still loses money although it only loses 0.19 meaning that if MGM were to drop by more than 0.19 the collar would outperform the naked stock because both would lose money, but the losses on the collar would be limited to 0.19, while the stock could drop all the way to zero.

An in-the-money collar is a great way to generate a high likelihood of a small loss, 0.19 in this case, and a small likelihood of a profit, 0.81 in this case.

A collar with the put struck in-the-money doesn't make much sense; the likelihood of a small loss is very high, and the position is bullish in that the stock has to rally to avoid that

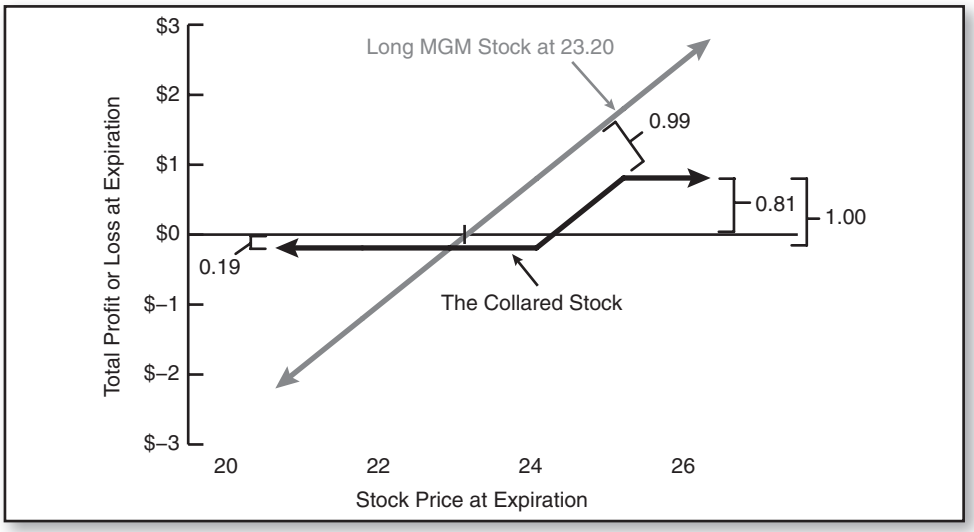


FIGURE 9.6 An In-the-Money Collar on MGM

loss. We could also execute a collar with an in-the-money call, that is, a call with a strike price below the current price of the stock and an out-of-the-money put. This collar will certainly generate net premium. But the underlying will almost certainly be called away.

Potential Outcomes

At expiration, there are three possible outcomes for any collar. The stock can be above the strike price of the covered call sold and the stock will be called away at that exercise price. The net proceeds will be the call strike price plus any net premium generated, or minus any net premium paid, for the collar. This point, at or above the call strike price, is where the maximum profit will be achieved.

The second potential outcome is that the stock is below the strike price of the protective put purchased. We would choose to exercise our put and sell our stock at that strike price. The net proceeds will be the put strike price plus any net premium generated, or minus any net premium paid, for the collar. This point, at or below the put strike price, is where the maximum loss will be realized.

It's possible that the stock could be precisely at a strike price. The likelihood of this is very small, but the profit from the stock being precisely at the call strike is identical to the profit from the stock being above the call strike price. Similarly, the loss from the stock being precisely at the put strike price is identical to the loss from the stock being below the put strike price.

The third potential outcome is that the stock is between the strike prices; that is, it's below the call strike price but above the put strike price. At this point, both

options will expire worthless, and we'll be left with our original position in that we'll be long the stock. If the underlying stock is between the strike prices at expiration, the outcome could be either a profit or a loss. Unless the stock hasn't moved since we executed our collar, we'll have a profit or loss on the stock even if it's above the put strike and below the call strike. Any net premium paid for our collar will reduce this profit and further increase any loss. Any net premium received for our collar will increase this profit or reduce this loss.

Of course, any time prior to the call option being exercised by the owner or at any time prior to expiration, we could close the collar position by buying back the call option we're short and selling the put option we're long. If the underlying stock has dropped since we executed the collar but hasn't gotten below the put strike price and our opinion is now that it won't get below the put strike price, then we might very well choose to sell the put, collect the premium for selling the put, and be left with a position that is long stock and short a covered call. In this way, by taking a profit in the put option we're long, we might offset a portion of the loss of value of the stock. This would leave the stockholder with no downside protection, but once the existing covered call has expired, or once it's closed out through repurchase, a new collar that's more relevant to the current price levels and option expiration dates could be executed.

And it's never possible to buy an in-the-money put and pay for it by selling an out-of-the-money call, so a collar with an in-the-money put is always going to cost money to execute and will always have a range over which it will experience a small loss.

A Zero-Cost Collar

Stock hedgers will often try to create a collar that has zero cost; that is, the covered call and the protective put have the same price. This means that the call premium generated pays for the put, there's "zero cost," but there's no credit generated either. The wide collar we looked at in MGM was a zero-cost collar. We received 0.05 for selling the 26 strike covered call and paid that 0.05 to buy the 20 strike protective put.

The appeal of a zero cost collar is that there's no need to pay for the collar, the hedger probably feels that he's getting the protection from the put for exactly what he's receiving for selling the potential upside via the call. He's right if he looks only at the premiums paid and received, but is the potential upside given equal to the protection received? We could reexamine our 20/26 collar in MGM but, as we saw, those strike prices are so far out-of-the-money that that collar doesn't act like a normal collar, so let's look at another stock to see if the protection from the put equals the potential upside surrendered.

Strike Price	Option Type		
	Call		Put
110	6.05	Buy This →	1.25
111	5.30	Put	1.45
112	4.57		1.70
113	3.87		2.00
114	3.22	&	2.35
115	2.63		2.76
116	2.09		3.22
117	1.63	Sell	3.75
118	1.25 ←	This	4.35
119	0.90	Call	5.00

The Resulting Collar Position

Long IWM ETF at 114.95
Short One 118 Strike Covered Call at 1.25
Long One 110 Strike Put at 1.25

This Is a Zero Cost Collar Since the Net Premium Is Zero

FIGURE 9.7 A Zero-Cost Collar in IWM

Figure 9.7 shows some options in IWM, the Russell 2000 exchange-traded fund (ETF), that we might use to construct a zero-cost collar.

In this collar, IWM was trading at 114.95, and we sold the 118 strike covered call at 1.25 to buy the 110 strike put at 1.25. Since the net premium is zero, this is a zero-cost collar.

Figure 9.8 shows the payoff for this collar.

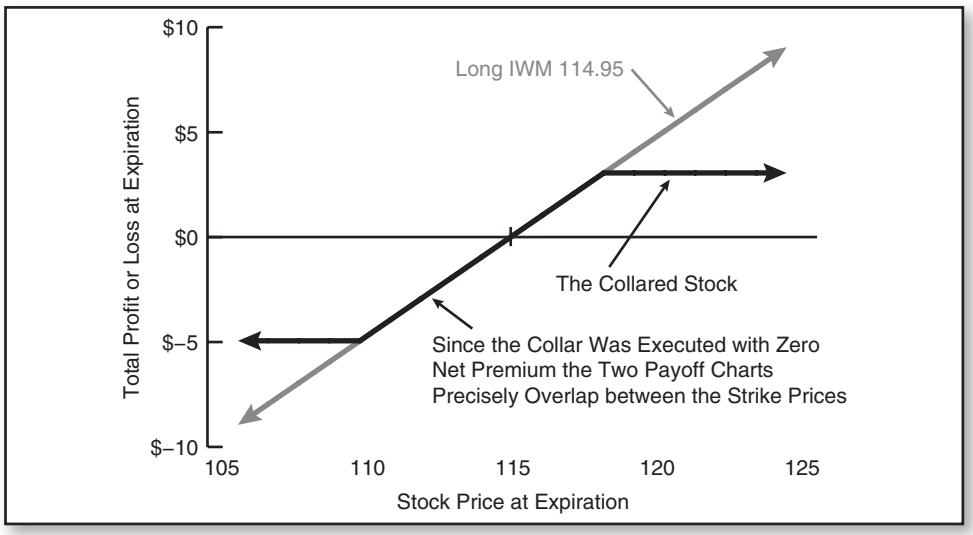


FIGURE 9.8 Payoff for a Zero-Cost Collar on IWM

We call this a *zero-cost collar,* and we didn't have to lay out any premium to execute it, but can we really do this for zero cost? IWM was at 114.95 so the 110 put is 4.95 away from at-the-money. This means this collar can lose 4.95 (114.95 – 110.00) and IWM has to drop 4.3 percent (from 114.95 to 110.00) before protection kicks in. Since the 118 call was only 3.05 (118.00 – 114.95) away from at-the-money, our collared stock can only profit by 3.05 (118.00 – 114.95) and will then stop appreciating and our stock will be called away with a rally of only 2.7 percent. This discrepancy between when protection kicks in and when appreciation stops is the real cost of a zero-cost collar. While it's true that the likelihood of making that 3.05 profit is greater (the delta of that 118 strike call was 31 meaning the odds of making 3.05 were 31 percent) than the likelihood of sustaining that 4.95 loss (the delta of that 110 strike put was 25 meaning the odds of losing 4.95 were 25 percent), if we do a little math (multiplying the potential profit or loss by the likelihood of that profit or loss to calculate an expected value), we find that the difference in likelihoods doesn't make up for the difference in outcomes. Even with the difference in likelihoods, there is a discrepancy in the potential profit and potential loss from our collared position.

What causes this discrepancy? It is other traders buying protective puts and selling covered calls. The result is that strike prices below at-the-money get relatively more expensive due to put buying demand and strike prices above at-the-money get relatively cheaper due to the selling pressure from covered calls. The phenomenon is called *skew,* and you can see it clearly in Figure 9.9, which shows the implied volatilities for each of the strike prices available in IWM at the time. Implied volatility is just the "apples-to-apples" measure of the cost of an option.

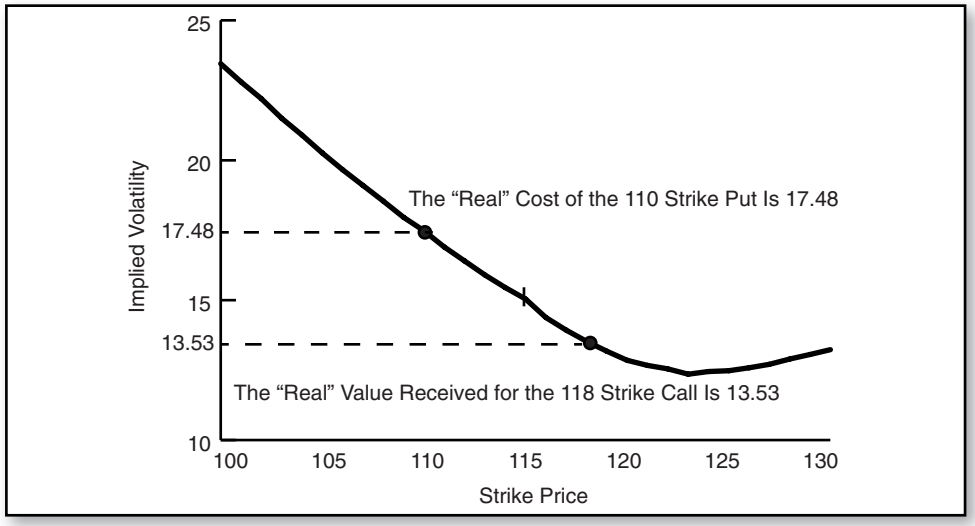


FIGURE 9.9 Why a Zero-Cost Collar Isn't Really Zero Cost—Option Skew

The implied volatility paid when purchasing the 110 put is 17.48 percent while the implied volatility received when selling the 118 call is only 13.53 percent. The result is that a zero-cost collar may not require us to pay any net premium, but it has a cost in that the protection received doesn't begin as quickly as the upside appreciate sold is forfeited.

You might ask if we couldn't turn this trade around and sell the expensive put while buying the cheaper call. If we did this without any underlying position in IWM, we'd get bullish exposure (bullish exposure from being long a call plus the bullish to sideways exposure from being short a put) while being helped by this skew. That structure, short a put and long a call, is a risk reversal, which we'll discuss in Chapter 10.

Skew

Skew has been a fixture in equity index markets since the 1987 crash, when everyone learned that markets can go down more, and more quickly, than anyone imagined. But skew works differently in other markets and while it's very prominent in equity index markets it's less pronounced in individual equities.

Skew is a big issue in equity index products because they can drop further and faster then they rise. What about skew in assets that can rise farther and faster than they drop? Things like U.S. government bonds, crude oil, gold, and VIX, the CBOE volatility index, tend to rise faster than they fall because they spike on geopolitical turmoil or supply shocks. Figure 9.10 shows skew in options on VIX, a measure of implied volatility on the S&P.



FIGURE 9.10 VIX Skew

With VIX at 12.46, we could have executed the 10/15 collar, that is, sold the 15 strike covered call, assuming we were long a VIX proxy, and bought the 10 strike put and done so for a credit of 1.15 by selling that 15 call at 1.20 and paying 0.05 for the 10 put. The fact that VIX is not directly investable is partly responsible for this, but additionally, not many people are interested in collaring their long VIX position; they're usually looking to capture all of any spike in VIX so there's relatively little selling pressure above at-the-money from sellers of covered calls. Below at-the-money, VIX by its nature can't go to zero so there's little demand for puts with low strike prices.

How a Collar Is Similar to Other Spreads and Combinations

Observant readers will notice that the payoff shape for a collar is identical to the payoff shape for selling a vertical put spread or buying a vertical call spread. That's no accident. A collar is like selling a vertical put spread because a collar buys a lower strike put while the combination of long stock and short a covered call is identical to a short put with the strike price of the call. This result, long a lower strike put and short a higher strike put (although a synthetic higher strike put) is a short put spread. Similarly, a collar is like buying a vertical call spread because the combination of long stock and long the put is identical to being long a call with the put's strike price. Combine that lower strike synthetic call with the short position in the higher strike call and you have a position that is identical to buying a vertical call spread.

You can see how these three trades are identical in Figure 9.11.

A collar is often used differently than either of those vertical spreads since a collar is executed versus an existing long position in the underlying stock and is usually intended to protect unrealized gains in that long stock. The similar vertical spreads are executed without any underlying stock position and are usually selected based on the trader's outlook for the underlying stock. If they think it's headed higher, they can buy the vertical call spread. If they think it's headed sideways, they can sell a vertical

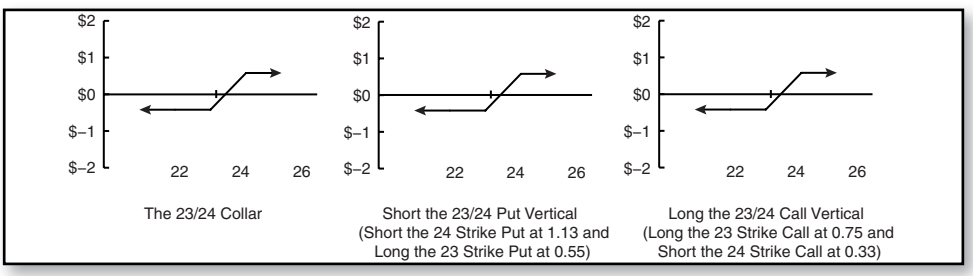


FIGURE 9.11 Similarities between a Collar and Bullish Vertical Spreads

put spread. You wouldn't do either if you were afraid the underlying stock would head lower, and that's exactly when you'd add a collar to your stock.

The concept of synthetic positions is discussed Chapter 13, "Conversions and Reversals."

Put Spread Collar

If our stock has appreciated, we might want to get some protection, and we might be willing to surrender some potential upside for that protection. This would be a traditional collar, but what if we want a put strike price that's really close to at-the-money and didn't want to pay a bunch of premium in order to put the trade on? Or if we wanted protection to kick in without paying the hidden price that skew charges? If we were looking to only protect a portion of our gains rather than pay for protection against the underlying stock dropping all the way to zero, then we might replace the long put in our collar with a long vertical put spread. The put spread would certainly cost less than the outright put would. This combination of long stock, short a covered call, and long a protective put spread is a put spread collar and is another example of replacing an option in one of our spreads or combinations with a vertical spread to change the nature or cost of the trade. Figure 9.12 shows the same IWM option prices we looked at earlier but shows how we might combine them differently to construct a put spread collar.

Strike Price	Option Type	
	Call	Put
110	6.05	Buy 1.25
111	5.30	This 1.45
112	4.57	Put 1.70
113	3.87	Spread 2.00
114	3.22	2.35
115	2.63	& 2.76
116	2.09	3.22
117	1.63	Sell 3.75
118	1.25 ←	This 4.35
119	0.90	Call 5.00

The Resulting Put Spread Collar Position

Long IWM ETF at 114.95
Short One 118 Strike Covered Call at 1.25
Long One 114 Strike Put at 2.35
Short One 110 Strike Put at 1.25

Collecting a Net of 0.15

FIGURE 9.12 A Put Spread Collar in IWM

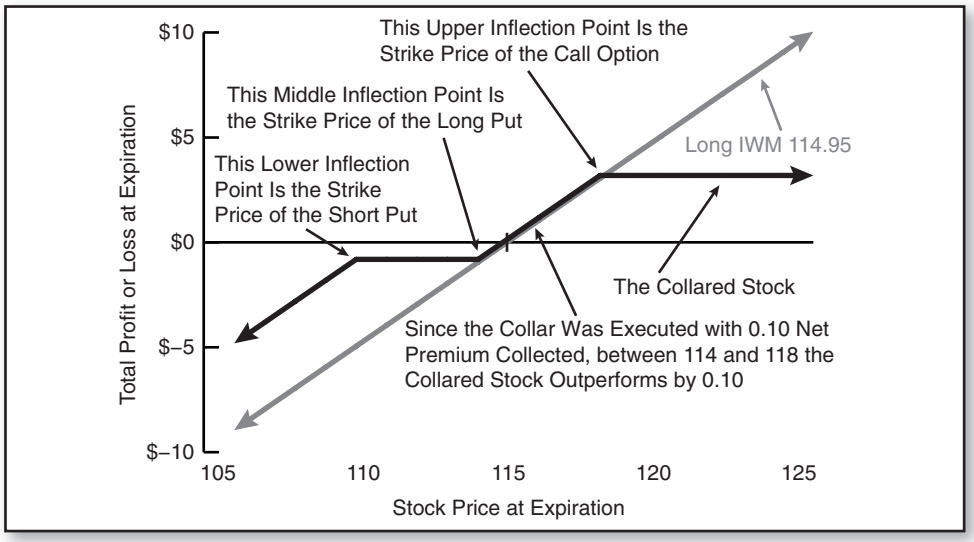


FIGURE 9.13 Payoff for a Put Spread Collar on IWM

This put spread collar in IWM replaces the long 110 strike put with the 110/114 put spread (long the 114 strike put at 2.35, short the 110 strike put at 1.25). In that put spread, we buy the 114 put at 2.35 to get downside protection and sell the 110 put at 1.25 to reduce the cost of the trade.

Since a put spread collar replaces the long put of a traditional collar with a long put spread, there's a limit to the downside protection. As you can see in Figure 9.13, the loss is only 0.80 between the strike prices of the put spread, 114 and 110, but the loss starts to increase again once IWM has dropped below that 110 strike price. At 110.00 the protection from the put spread has been exhausted and losses resume.

As with any vertical put spread we buy, the put spread will have achieved its maximum value at expiration with the underlying at or below that lower strike price so the put spread will be worth 4.00 at and below 110.00, and we'll get to keep that 4.00 no matter how low IWM goes. Unfortunately, losses on the IWM shares we're long will continue to increase, and losses on our total position will resume with the underlying stock below the put spread. This means that a put spread collar is intended to provide a moderate amount of downside protection for a reasonable cost, but not complete protection all the way down to zero. The benefit of a put spread collar is that the call can be struck farther out of the money than the long put, meaning that we get protection more quickly than we cease to participate in upside appreciation. For example, in our IWM put spread collar, the 118 call was 3.05 (2.7 percent) away from at-the-money so IWM could rally 2.7 percent before we stopped participating. The 114 put was only 0.95 (0.8 percent) from at-the-money meaning that protection would kick in after a drop of only 0.8 percent. Again, by replacing the protective put with a protective

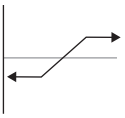
vertical put spread, that protection is eventually exhausted. In this case, that happens at 110.00, so IWM would have to drop 4.95 (4.3 percent) before that happened.

Call Spread Collar

One of the fundamental elements of a collar is that a collar will eventually cease to participate in any appreciation in the underlying stock. If you thought there was a real opportunity for the stock to rally significantly, then might you replace the covered call in a collar with a short call spread? This would essentially be like executing a traditional collar, then buying an upside call to guarantee that if the underlying stock rallied enough, we'd resume participating in the appreciation.

Call spread collars aren't very common, and with good reason. If you thought there was a reasonable likelihood that your stock would rally significantly, then a collar isn't the best strategy. Buying an outright put for protection or replacing your long stock with a long call would generate absolute downside protection without truncating upside appreciation.

Collar Cheat Sheet

	Collar
Description	Long underlying stock, short OTM covered call, long OTM put
Example	ATM = 100 Long 100 shares of stock Short one 105 strike call Long one 95 strike put
Pay or Collect Premium	Pay or collect very small amount of net premium
Needed Directionality	
Passage of Time without Market Movement	Little or no net impact
Increase in Implied Volatility without Market Movement	Little or no net impact
Payoff Thumbnail Chart	
Maximum Risk	Price of the stock when the collar is executed minus put strike price plus any net premium paid or minus any net premium received
Maximum Profit	Call strike price minus price of the stock when the collar is executed minus any net premium paid or plus any net premium received
Breakeven Points	Current stock price

CHAPTER 10

Risk Reversal

If you were bullish on a stock, you might buy an out-of-the-money call option. If the stock rallied above the strike price of the call by more than the price of the option, then you would make money. But the rally required, to a level that is above the strike price by the cost of the option, can be pretty big, particularly if we've bought a call on a stock with a high implied volatility or if we've bought a call that's substantially out-of-the-money. And in buying a call option we can be right, the stock can rally, and we can still lose money if it doesn't rally enough.

Or you might sell an out-of-the-money put. This is a bullish to sideways position. As long as the stock didn't drop below the strike price of the put by more than the premium received this trade would be profitable. In selling a put, you wouldn't have to pay any premium; in fact, you'd be collecting premium, and that premium would be yours to keep, no matter what the underlying stock did. If the stock is below the strike price at expiration, then you're going to end up buying the stock at that strike price, but selling a put works best if the stock has moved up or sideways at expiration and if the stock appreciates enough then the amount of put premium collected will be tiny in relation to the profit from buying a call option even though the call option requires us to pay for the option.

If you were to combine these two positions, long a call option and short a put option, you would have a risk reversal. A *risk reversal* is a combination made up of a long call that is struck out-of-the-money and a short put that is struck out-of-the-money. The two options share the same expiration date. Like a long position in the stock, a risk reversal is bullish in that it does best when the underlying stock rallies significantly. For the risk reversal, this is because it's long a call. Like a position in the stock, a risk reversal does most poorly when the underlying stock drops because

it's short a put and will end up buying the stock at that put strike price regardless of how low the stock drops.

A risk reversal will generate net premium we get to collect and keep if we collect more for selling the put than we spend to buy the call. A risk reversal will require us to pay some net premium if we pay more to purchase the call than we collect for selling the put.

A risk reversal has nearly unlimited loss potential since being short the put is much like being long the stock. Both a short put position and a long stock position have limited risk only because the price of the underlying stock can't drop below zero. A risk reversal has unlimited profit potential, since it is long a call option and the value of that call will increase as the price of the underlying stock increases.

Figure 10.1 shows options on Wal-Mart (WMT), including some call options that we might buy and some put options we might sell. It also shows how we might combine those two positions into a risk reversal. WMT was trading at 78.13 when these option prices were observed.

We could execute the 75/82.50 risk reversal for a net credit by selling that 75 strike put at 0.95 and using that premium to buy the 82.50 strike call at 0.38. We would keep the 0.57 net difference.

How would this risk reversal make money? Since we received that 0.57 net credit, this trade is profitable as long as WMT is above 74.43 (75.00 – 0.57) at expiration. But we execute a risk reversal because we're bullish, we think the stock is going higher, so our goal isn't to just collect and pocket that net premium. Our goal is to make more money by participating when WMT rallies while buying it at a discount to the

Strike Price	Option Type: Call			Option Type: Put
67.50	10.75			0.15
70	8.35			0.25
72.50	6.10		Sell	0.50
75	3.95		This →	0.95
77.50	2.18	&	Put	1.82
80	1.00	Buy		3.25
82.50	0.38 ←	This		5.10
85	0.13	Call		7.30
87.50	0.06			9.45
90	0.03			11.90

The Resulting 75/82.50 Risk Reversal Position

Long One 82.50 Strike Call at 0.38
Short One 75 Strike Put at 0.95

Collecting a Net of 0.57

FIGURE 10.1 A Risk Reversal in Wal-Mart (WMT)

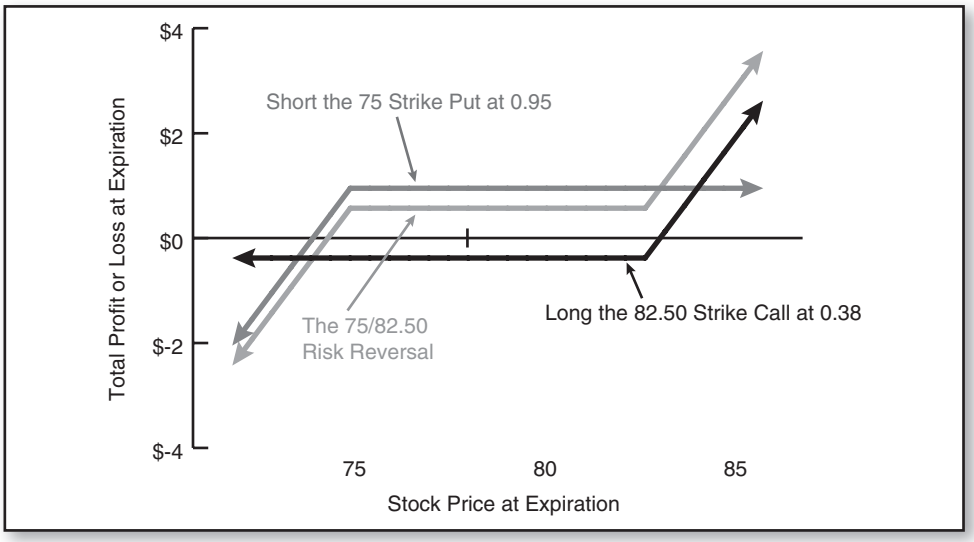


FIGURE 10.2 The WMT 75/82.50 Risk Reversal

current stock price if WMT drops. In this case, with WMT above 82.50 at expiration, we'll exercise our call option and get long WMT at an effective price of 81.93 (82.50 – 0.57), but we'd do so only if WMT were above the 82.50 call strike price.

Since we're bullish and might have bought WMT stock instead of executing this risk reversal, we're willing to take some downside risk and be forced to buy WMT if it drops. Our effective price would be 74.43, but since we're short this put, we don't get to decide; we're going to buy WMT if it's below 75.00 at option expiration because the owner of the put will exercise the option and put the stock to us. Figure 10.2 shows the payoff chart for the call we're long, the put we're short and the combined risk reversal position.

Figure 10.2 shows the constituent long 82.50 strike call and short 75 strike put because that's what a risk reversal is, we're selling that put to pay for that call and if WMT drops enough and is below the put strike price at expiration or rallies enough and is above the call strike price at expiration, then we're going to get long WMT stock. It also shows the resulting 75/82.50 risk reversal.

You'll notice that the inflection points for the risk reversal occur at the strike prices of the constituent options, 75 and 82.50 in this case. At 82.50, the strike price of the call option, the profit from the risk reversal starts to increase from the 0.57 collected as the value of the call at expiration starts to rise. Below 75, the strike price of the put option, the risk reversal starts to give up its profit until reaching break even at 74.43 (the 75 put strike price minus the net credit of 0.57 collected) and for all WMT prices below 74.43 at option expiration the risk reversal loses money with the loss increasing as WMT drops just as the loss would increase if we were simply long the stock.

Between the strike prices, this 75/82.50 risk reversal is profitable because we received more for selling the 75 strike put than we paid for purchasing the 82.50 strike call. If WMT is between the strike prices at expiration, then the put we're short will expire worthless and we would let the call option we're long expire worthless. We would pocket the net credit of 0.57 and have no position. At this point, we could buy WMT, execute a new risk reversal, or look for another opportunity.

This range between the strike prices provides some margin of error. Between there we end up with zero position at expiration. The underlying stock might have gone up a little and a risk reversal will miss that move, but the underlying stock might have gone down a little and the risk reversal will miss that loss as well. This means that a risk reversal is generally agnostic to changes in volatility. If implied volatility goes up, the price of the call option will increase, which helps, but this is offset by the increase in the price of the short put. A risk reversal wants realized volatility only if it takes place in the correct direction—up. A risk reversal isn't a volatility play; it's almost exclusively a directional play while getting some help from skew. We discussed skew in Chapter 9 when we looked at collars. Here, we'll examine how skew can help our risk reversal. We'll also look at the greeks for risk reversals in the greek cheat sheet at the end of this chapter, but it's important to remember that since implied volatility tends to increase when a stock's price declines and tends to decrease when a stock's price increases, taking a risk reversal off after the stock price has changed can be hurt by volatility slope, the tendency for volatility to increase or decrease as the stock price decreases or increases.

Until the profit from the risk reversal turns upward again, with the underlying stock above the strike price of the long call, WMT above 82.50 in this case, the risk reversal is less profitable than the short put option alone would be. This makes sense, we had to pay for the call option that we're long and below the call strike price the difference between the result for the short put and the result for the risk reversal is the cost of the call option bought. You can see these differences and inflection points in Figure 10.3.

We'll be paid this 0.57 net credit as soon as we execute this risk reversal, and that 0.57 is ours to keep no matter what, but we won't actually earn that 0.57 until the options erode away and expire. We're familiar with option erosion and how it accelerates as expiration nears, but in a risk reversal we're short a put, which erosion will help, and we're long a call, which erosion will hurt. What will this erosion actually look like over time? Figure 10.4 shows the erosion for this 75/82.50 risk reversal.

You'll notice that the erosion occurs in a relatively straight line. This is because the two constituent options were relatively equidistant from at-the-money when the risk reversal was initiated and we assume the underlying didn't move for the term of these options. When this risk reversal was executed, the call option was 4.37 away from at-the-money (82.50 – 78.13), while the put option was 3.13 away from at-the-money (78.13 – 75.00).

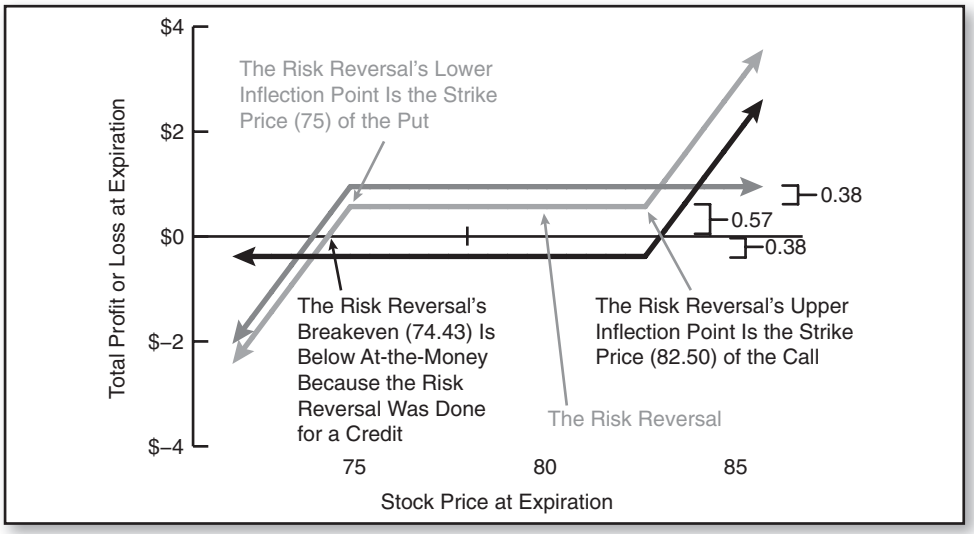


FIGURE 10.3 Payoff for Our 75/82.50 Risk Reversal in Wal-Mart (WMT)

This risk reversal generated a net credit and that will often be the case because, all things being equal, puts tend to be more expensive than calls for the reasons we discussed in the section on skew in Chapter 9. But not all risk reversals will generate a net credit and, just as when selecting strike prices for our collar, if spending a little money results in a risk reversal with strike prices that are more appealing in relation to an important level on the stock chart or your desired entry point, then

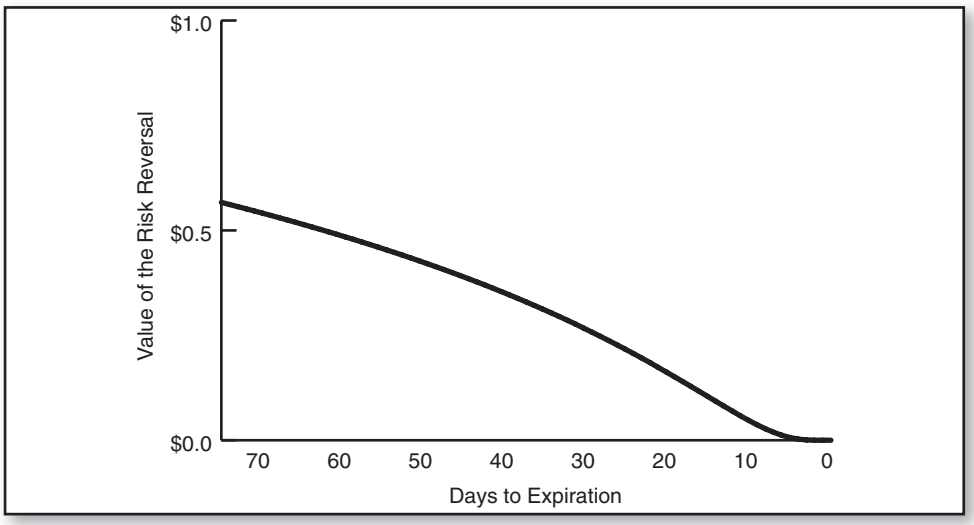


FIGURE 10.4 How Our 75/82.50 Risk Reversal Erodes without Any Movement

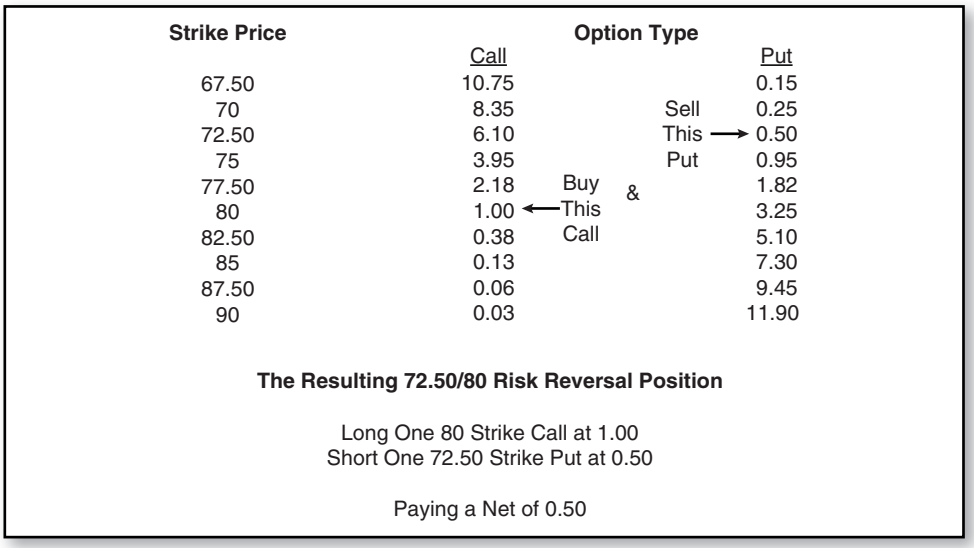


FIGURE 10.5 A Second Risk Reversal in Wal-Mart (WMT)

spending a little bit of net premium to execute a better risk reversal is probably money well spent. The very nature of a risk reversal means that you shouldn't spend a lot of premium; if you want to spend a lot of premium, then there are better trade structures than a risk reversal. But regardless of the net premium paid or received, skew will almost always help a risk reversal on an equity or equity index and will almost always hurt a collar on those underlyings.

Paying net premium to execute a risk reversal will change the payoffs for the trade slightly. For example, if the underlying stock is between the strike prices at expiration the risk reversal done at a net debit will realize a net loss. That loss will be the net premium spent. Figure 10.5 shows the same WMT options prices we saw earlier but uses different strike prices to generate a risk reversal that would require a small payment when executed.

This second risk reversal, the 72.50/80 risk reversal, would cost 0.50 (1.00 paid for the 80 strike call option minus 0.50 received for selling the 72.50 strike put option) and that net debit of 0.50 would be the loss if WMT is between the strike prices, 72.50 and 80 in this case, at expiration. We'll sustain that loss because both options will expire worthless and we'll be left with no position, but we will have spent that 0.50 to establish the risk reversal. In exchange for that potential loss, this risk reversal starts participating to the upside with WMT above 80.00 (as opposed to 82.50 for the first risk reversal we looked at) and doesn't get WMT stock put to us unless it's below 72.50 at expiration (the first risk reversal we looked at had WMT stock put to us with WMT below 75 at option expiration). Figure 10.6 shows the payoff for this risk reversal executed at a debit.

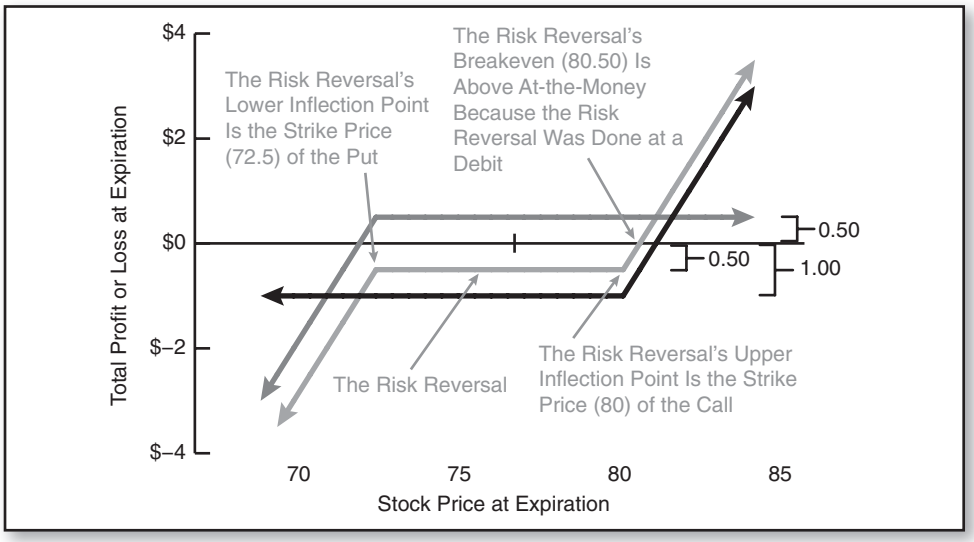


FIGURE 10.6 Payoff for the 72.50/80 Risk Reversal in Wal-Mart (WMT)

These two constituent options differed quite a bit in the amount they were out-of-the-money. The 72.50 put was 5.63 out-of-the-money (78.13 – 72.50), while the 80 strike call was only 1.87 out-of-the-money (80 – 78.13). Does this change how this risk reversal will erode over time? Yes, it does. Since the put option we are short is farther out-of-the-money, the risk reversal will erode more like an outright option, meaning that erosion will accelerate as expiration nears. Figure 10.7 shows how this risk reversal will erode.

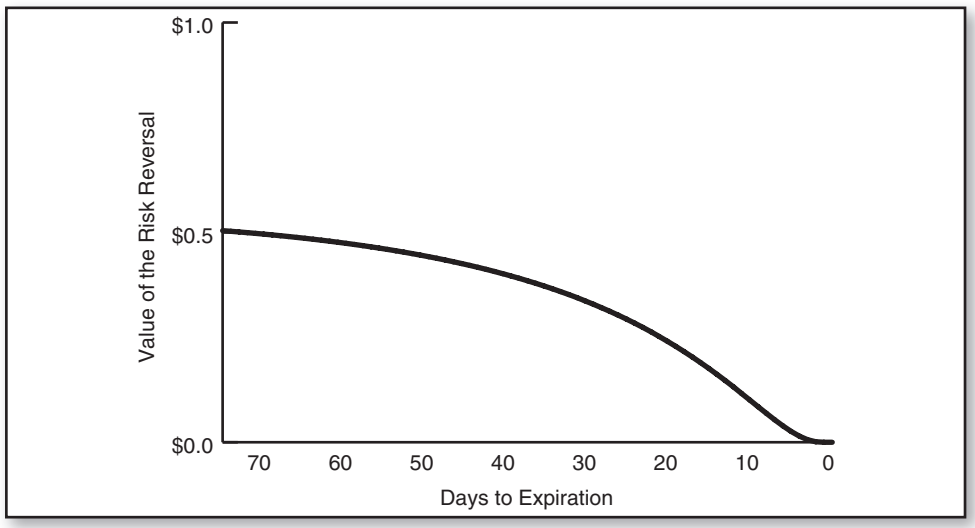


FIGURE 10.7 How Our More Bullish Risk Reversal Erodes

Likelihoods

As with selling a put to buy stock at a discount, we're not trying to dodge a bullet when using a risk reversal. We think the stock is going higher and we want to participate if it does so, while being willing to purchase it at a discount from the current price if we have to. With the first risk reversal, the 75/82.50 risk reversal, we wanted to participate if WMT broke out to the upside and we were willing to buy at a discount if it dropped. In using a risk reversal, we can get this exposure while spending very little premium or even collecting net premium. In selling a covered put we're willing to buy at a discount while being paid to find out if we will. With a risk reversal, we're willing to buy at a discount, but we don't want to miss a big move to the upside.

Since we're trying to get bullish exposure, it's important to know the likelihood of having the stock put to us as well as the likelihood of having the stock above the strike price of the call meaning we'd exercise our call and get long the stock at the effective purchase price. These likelihoods are the option deltas we looked at earlier. Table 10.1 shows the two risk reversals we've looked at so far and the likelihoods of getting long WMT for each.

The likelihood of eventually owning WMT stock using the first risk reversal, the 75/82.50, is 44 percent (28 percent of getting put the stock plus 16 percent of exercising our call) while the likelihood of eventually owning WMT stock using the second risk reversal is 49 percent (16 percent plus 33 percent). These two combined likelihoods are very similar, each risk reversal has a slightly less than 50 percent chance of eventually owning the stock, and that makes sense, we didn't change the width of the risk reversal, we just moved each strike down a little. The effective purchase prices would be slightly different than these strike prices depending on the net premium paid or received for the risk reversal but the strike prices are how we figure the likelihood of paying those effective prices. Note that these odds are the deltas of these options because if WMT is below the put strike by just 0.01 at expiration, theoretically, we'll get put the stock. Similarly, if WMT is above the call strike price by just 0.01, we'll theoretically choose to exercise our call.

Since we're bullish WMT if we're using a risk reversal, a less than 50 percent chance of buying the stock may not be enough for us. We could tighten up the strike prices as

TABLE 10.1 **Important Likelihoods for Our Risk Reversals**

75/82.50 Risk Reversal				72.50/80 Risk Reversal			
Lower Purchase Price	Likelihood	Upper Purchase Price	Likelihood	Lower Purchase Price	Likelihood	Upper Effective Purchase Price	Likelihood
75.00	28%	82.50	16%	72.50	16%	80.00	33%

much as possible and thereby increase the likelihood that we'll end up long the stock at expiration. For example, the tightest strike prices in WMT would result in the 77.50/80 risk reversal. We would execute that risk reversal by selling the 77.50 strike put at 1.82 and use that premium to buy the 80 strike call at 1.00. The delta of that 77.50 put is 46 and the delta of 80 call is 33 meaning that the likelihood of owning WMT after expiration is 79 percent. This is just about as high a likelihood as a risk reversal will generate.

But actually buying the stock at expiration isn't the only way to make money with a risk reversal. In fact, if we buy the stock by having it put to us then we'll lose money if the stock is below the effective purchase price.

How else might our risk reversal make money? How can we make money even if our underlying stock doesn't get above the strike price of the call? By watching as the underlying stock rallies, causing our short put to drop in value and our long call to increase in value. For example, what would happen to our 72.50/80 WMT risk reversal, the one that cost us 0.50 to execute, if WMT rallied by 1.50 immediately after we executed the trade? That means WMT would rally from 78.13, which is where it was when we saw those option prices, to 79.63, which is still below the call strike price and is well below our breakeven point at expiration of 80.50. Let's look at Table 10.2 to see just how much profit this risk reversal would generate, despite never getting above the call strike price, if it rallied like that.

Table 10.2 shows that the unrealized gain on the short put after this jump would be 0.20 (0.50 – 0.30), the put is profitable because we're short it and the price has fallen. The unrealized gain on the long call after this jump would be 0.62 (1.62 – 1.00), the call is also profitable because we're long it and the price has risen. In total, the risk reversal has an unrealized gain of 0.82 because we could sell the call for 1.62 and buy the put back for 0.30, leaving us 1.32. The risk reversal initially cost 0.50 to execute, so our unrealized profit is 0.82.

But this profit of 0.82 is unrealized, and since WMT is still below the breakeven price at expiration of 80.50, we're in a bit of a race. Time decay will start eating at the value of our long call to a greater degree than we'll benefit from time decay of our short put, since the call is now worth so much more than the put. As with some other option strategies, it's possible to get the direction right (up) and still lose money with a risk reversal even if we have a huge head-start, as we do after WMT has made this hypothetical jump to 79.63.

TABLE 10.2 **Our Risk Reversal after a Rally but Prior to Expiration**

Option Position	Value at Execution (75 Days to Expiration)	Value after 1.50 Jump in WMT the Day after Execution (74 Days to Expiration)	Profit to the Risk Reversal
Short 72.50 put	0.50	0.30	0.20
Long 80 call	1.00	1.62	0.62

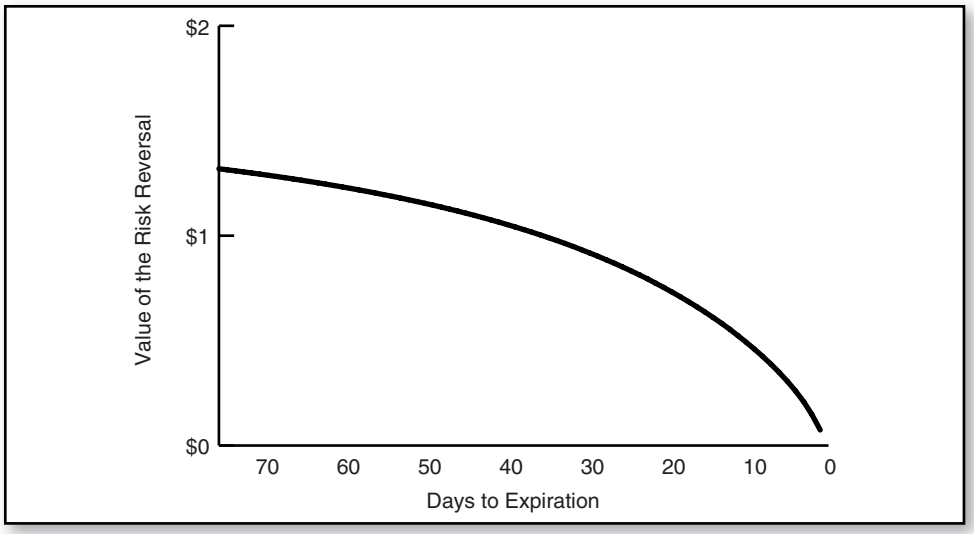


FIGURE 10.8 How Our 72.50/80 Risk Reversal Will Erode after a Rally

If WMT stayed at 79.63 until expiration we would have had a profit and turned it into a loss, since we would end up losing that 0.50 net debit paid despite having an unrealized profit of 0.82.

How will this risk reversal erode after this hypothetical jump? Figure 10.8 shows how this risk reversal would erode after this jump. Note that the erosion occurs in the sort of curve that we expect from outright options, erosion will accelerate as expiration nears. That's because the call strike is now so close to at-the-money. This risk reversal after the jump is much more like that of a long call than a risk reversal.

How Skew Helps a Risk Reversal

In Chapter 9, we saw how skew, the tendency for different strike prices to have different implied volatilities due to factors like jump risk, buying demand for puts from hedgers and selling pressure on calls from covered call sellers, can increase the cost of our collar. Since the option portion of a collar is the opposite of a risk reversal, which is selling a put—and that put should be more expensive due to this buying demand—and buying a call—and that call should be less expensive due to that selling pressure—skew should help our risk reversal. Let's look at the implied volatility for each of these WMT strike prices and see if that's the case for the risk reversals we've been considering. Figure 10.9 shows those implied volatilities and the skew is evident once you connect them.

As the strike prices fall from the at-the-money price of 78.13, implied volatility climbs. As the strike prices rise from that at-the-money price, the implied volatility falls until the

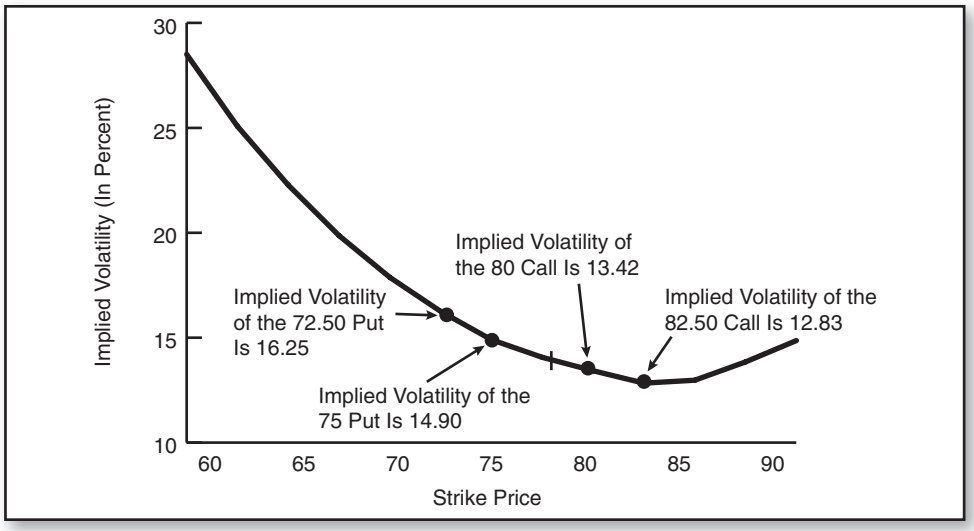


FIGURE 10.9 Implied Volatility Skew in WMT Options

options get very cheap in dollar terms, when the implied volatility starts rising again. This is the typical shape of a volatility skew chart for an equity or equity index underlying.

The first risk reversal we examined, the 75/82.50 risk reversal shows a difference of 2.07 volatility points (14.90 – 12.83) in implied volatility. The second risk reversal, the 72.50/80 risk reversal, shows a difference of 2.83 volatility points (16.25 – 13.42). How does that difference manifest itself? As we saw when discussing collars, one way skew impacts our risk reversal is the distance the strike prices are from at-the-money. In the 72.50/80 risk reversal, the 72.50 put, the point at which we would have to buy the stock, is 5.63 away from at-the-money, while the 80 call, the point at which we'd start to participate to the upside, is only 1.87 away from at-the-money. It's true that this trade cost us 0.50 to put on but for that 0.50 and thanks to skew, WMT would have to fall over 7 percent before we'd be forced to buy the stock while it has to rally only 2.4 percent before we'd start to make some money back.

Another way skew is manifested is in the option prices, and this is usually the easier way to recognize the impact, particularly when the strike prices are not equidistant from at-the-money as in these risk reversals. Table 10.3 shows the impact of

TABLE 10.3 How Skew Helps a Risk Reversal

Risk Reversal	Put Option Implied Volatility	Call Option Price if It Had Put Option's Implied Volatility	Difference between Observed and Theoretical Call Prices	Value of Skew to Risk Reversal
75/82.50	14.90	0.72	0.34	0.34
72.50/80	16.25	1.59	0.59	0.59

skew on both of these risk reversals by using the tools at www.OptionMath.com and calculating the option prices as if both options had the same implied volatility.

Both trades benefit from skew. The 82.50 call we buy in the 75/82.50 risk reversal would be 0.34 more expensive if it had the same, higher, implied volatility as the 75 put. The 80 call we buy in the 72.50/80 risk reversal would be 0.59 more expensive if it had the same implied volatility as the 72.50 put.

Call Spread Risk Reversal

What if we wanted to be long a call with a strike price that was very close to at-the-money without paying any net premium meaning that we would participate in a rally in the underlying stock even if the rally was minor but that we would do so inexpensively? What if we wanted to be short a put with a strike price that was significantly below at-the-money, meaning that the underlying stock would have to drop substantially before we would get put the stock, but again we wanted to do so inexpensively?

We could replace our long call with a long call vertical spread because this would reduce the cost of that long exposure. This would allow us to buy a call that was closer to at-the-money, although we'd also be short an out-of-the-money call, meaning that our participation in any rally would eventually end. Or it would allow us to sell a put that was farther from at-the-money, meaning that the underlying stock would have to drop further before we had it put to us. This would be a call spread risk reversal.

A call spread risk reversal replaces the long call with a long call vertical spread, which results in a finite amount of potential profit if the underlying stock were to rally. Our downside risk is still limited only by the fact that the underlying stock couldn't fall below zero. Figure 10.10 shows a call spread risk reversal we might construct from the WMT options we've been looking at.

If we were to sell the 70 strike put at 0.25, we could use that premium to buy the 82.50/85 call vertical spread. We'd be long a call that was 5.6 percent from at-the-money requiring that 5.6 percent move for our call spread to have any value at expiration, but we'd be short a put that was over 10 percent from at-the-money, a put that would require that move of over 10 percent before we experienced losses and had the stock put to use at expiration.

Our potential loss from that short put is 70.00, but that would require the stock to fall all the way to zero—a pretty unlikely outcome. Since we're long a call spread rather than an outright call like our previous risk reversals, our profit is now capped, just as it is for any vertical call spread. In this trade, our profit is capped at the width of the call spread, since we didn't pay or collect any net premium to put the trade on. Our maximum net profit for this call spread risk reversal is 2.50. Let's connect the dots and see the payout for this call spread risk reversal at expiration across a range of stock prices. You can see that in Figure 10.11.

Strike Price	Option Type	
	Call	Put
67.50	10.75	0.15
70	8.35	0.25
72.50	6.10	0.50
75	3.95	0.95
77.50	2.18	1.82
80	1.00	3.25
82.50	0.38	5.10
85	0.13	7.30
87.50	0.06	9.45
90	0.03	11.90

Sell This Put → 0.25

&

Buy This 82.50/85 Call Spread at 0.25

The Resulting 70/82.50/85 Call Spread Risk Reversal Position

Long One 82.50 Strike Call at 0.38
Short One 85 Strike Call at 0.13
Short One 70 Strike Put at 0.25

Neither Paying nor Collecting Any Net Premium

FIGURE 10.10 A Call Spread Risk Reversal in WMT

You'll notice that even though we were able to execute this risk reversal without paying any net premium, the upper inflection point, 85.00, where profits start to accrue, is much closer to the at-the-money price of 78.13 than the lower inflection point, 70.00, where losses start to accumulate. That's the result of buying that cheaper call spread rather than the more expensive outright call. The trade-off is that our profits are capped at 2.50, with WMT at or above 85.00.

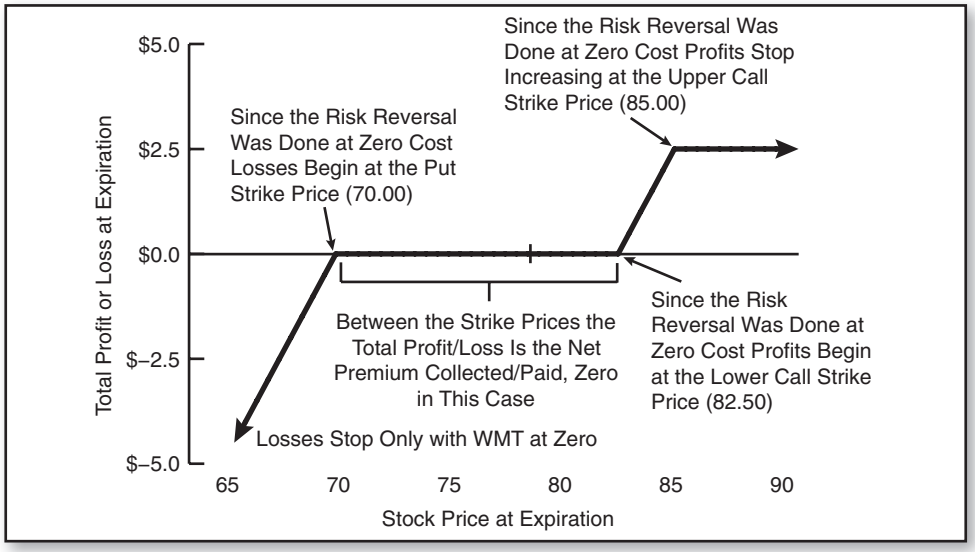
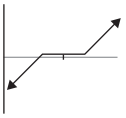


FIGURE 10.11 Payoff for 70/82.50/80 Call Spread Risk Reversal in WMT

Risk Reversal Cheat Sheet

	Risk Reversal
Description	Long OTM covered call, short OTM put, long cash to buy stock at the strike price
Example	ATM = 100 Long one 105 strike call Short one 95 strike put Long $9,500
Pay or Collect Premium	Pay or collect very small amount of net premium
Needed Directionality	
Passage of Time without Market Movement	Little or no net impact
Increase in Implied Volatility without Market Movement	Little or no net impact
Payoff Thumbnail Chart	
Maximum Risk	Strike price of the put minus any net premium received (if stock drops to zero)
Maximum Profit	Theoretically unlimited
Breakeven Points	Call strike price ± Any net premium received Put strike price ± Any net premium received

CHAPTER 11

Butterflies

In constructing a vertical spread, we bought one option and sold a very similar option. What happens if we take that thinking a step further and buy one vertical spread and sell a very similar vertical spread? We would reduce the cost of the trade dramatically, that means we would reduce risk, and we would potentially increase leverage if our cost falls but our maximum profit stays the same. Those are all good things.

If we made it a point to select the strike prices of our vertical spreads carefully so that the long leg of the first vertical spread and the long leg of the second vertical spread are the same option, then we've created a *butterfly spread*. We've also created a butterfly if the short leg of the first vertical spread and the short leg of the second vertical spread are the same option. A butterfly is the first spread that we're going to look at that's really a spread or combination of other spreads. Figure 11.1 shows how we might execute a butterfly.

In this generic butterfly, we're buying the 51/54 call spread and selling the 54/57 call spread. The resulting position is long one 51 call, short two 54 calls, and long one 57 call. This cumulative position is long one 51/54/57 call butterfly.

A long butterfly is a defined risk strategy that is generally very inexpensive to establish and has a defined potential profit that is usually several times greater than the risk, which is the cost of the butterfly. The likelihood of realizing this maximum profit is very small, as we'll discuss.

A short butterfly is a defined risk strategy with a defined potential profit that is very small in relation to the risk but the likelihood of sustaining any loss is usually small and the likelihood of sustain the maximum loss is very small.

Let's look at some actual option prices and pick two vertical spreads to combine into a butterfly. Figure 11.2 shows option prices and the vertical spreads we might select.

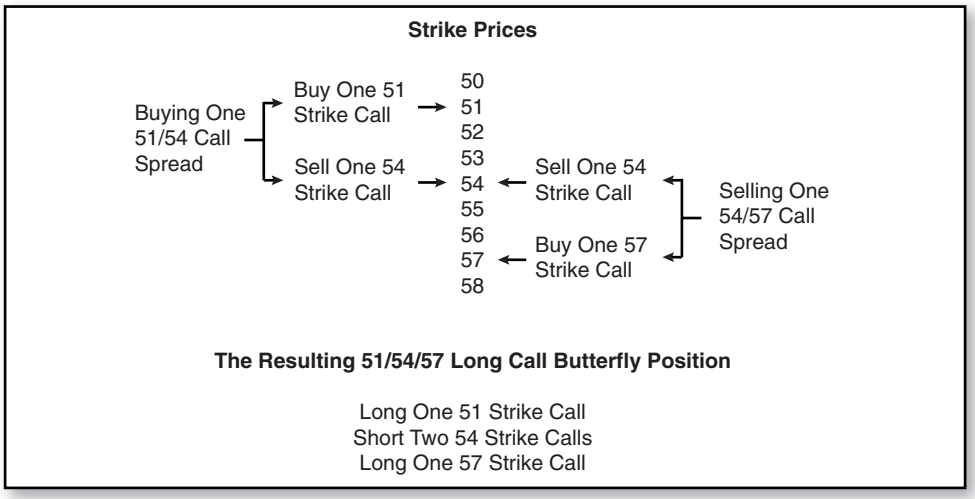


FIGURE 11.1 Creating a Long Call Butterfly

In Figure 11.2, we construct a call butterfly by buying the 130/132 call spread at 0.80 (buying the 130 call at 2.98 and selling the 132 call at 2.18) while also selling the 132/134 call spread at 0.61 (selling the 132 call at 2.18 and buying the 134 call at 1.57). The entire position is long the 130/132/134 call butterfly, sometimes referred to simply as a *fly,* at 0.19.

The entire trade costs 0.19 (0.80 paid for the 130/132 call spread minus 0.61 received for selling the 132/134 call spread), and when buying a butterfly (buying

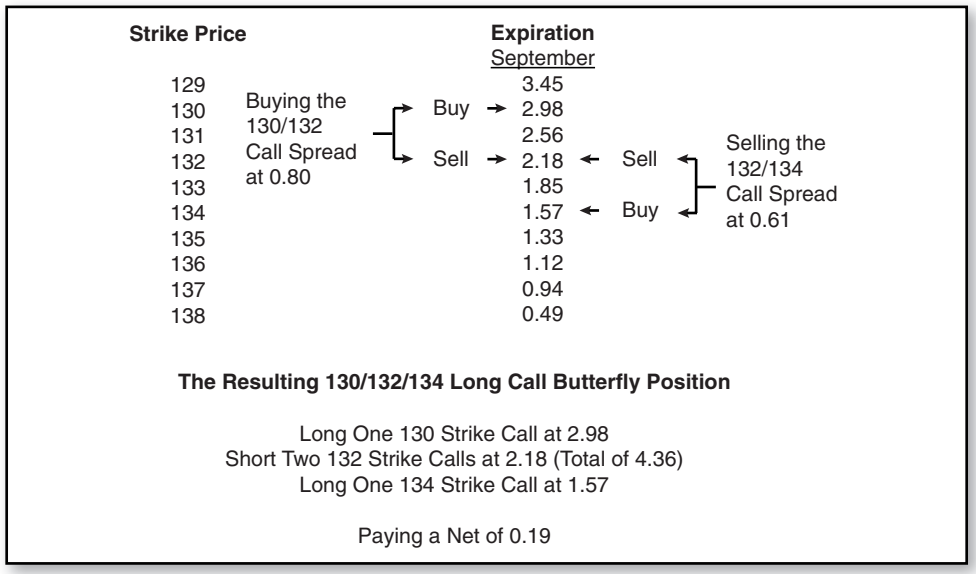


FIGURE 11.2 Call Options and Buying a Butterfly Spread

the "wings" and selling the "body") we'll always pay money. If you'll stop and think about our butterfly as a spread of two vertical spreads, it will become clear why we will have to pay money to buy our butterfly if we're buying the wings and selling the body. The vertical spread we buy, the one that is closer to at-the-money, will be more expensive than the vertical spread we sell, the one that is farther from at-the-money. Since the likelihood of that first vertical spread reaching its maximum potential value is greater, because it's closer to at-the-money, we'd be willing to pay more for it. That's why we have to pay when we buy a butterfly.

As with any spread we buy, and a butterfly is a spread made up of two other spreads, our maximum loss is what we pay, 0.19 in this case. While it's more important to look down than up before we jump, we're also interested in profit and when we realize that profit. Let's create the sort of profit and loss table that we've done previously to see how and when this trade makes and loses money, but let's be certain to treat this butterfly as a spread of two other spreads. We do this in Table 11.1 and we see the resulting butterfly.

The maximum loss is 0.19, as we've already discussed, and we sustain that loss below the lowest strike, the 130 strike, and above the highest strike, the 134 strike. The maximum profit is 1.81, but that is realized only with the underlying stock precisely at the middle strike, 132.00. That maximum profit falls off sharply as the underlying stock falls from, or rallies above our middle strike, 132.00. This means that a butterfly makes its maximum profit only when the underlying stock is precisely at that middle strike price, unlike a single vertical spread where the maximum profit is achieved with the underlying at any point above or below the spread, depending on vertical call spread versus vertical put spread and on long versus short. It also means that a butterfly has two points at which the trade breaks even: the lower breakeven and the upper breakeven.

TABLE 11.1 Call Spreads and the Resulting Butterfly

Stock Price at Option Expiration	Value of 130/132 Call Spread at Expiration	Profit or Loss on 130/132 Call Spread at Expiration	Value of 132/134 Call Spread at Expiration	Profit or Loss on 132/134 Call Spread at Expiration	Total Profit or Loss for Butterfly
128	0.00	–0.80	0.00	0.61	–0.19
129	0.00	–0.80	0.00	0.61	–0.19
130	0.00	–0.80	0.00	0.61	–0.19
131	1.00	0.20	0.00	0.61	0.81
132	2.00	1.20	0.00	0.61	1.81
133	2.00	1.20	1.00	–0.39	0.81
134	2.00	1.20	2.00	–1.39	–0.19
135	2.00	1.20	2.00	–1.39	–0.19
136	2.00	1.20	2.00	–1.39	–0.19

The payoff chart at expiration for the long call butterfly shows a very small loss over a large range of strike prices both below the strike prices of the butterfly as well as above the strike prices of the butterfly. This makes sense and is consistent with the idea that a butterfly is really just a spread made up of two vertical spreads. For this long call butterfly, the 130/132 call vertical we're long is a loser below the breakeven of 130.80, but then makes money up to the maximum profit of 1.20, which is realized with the underlying stock at or above 132.00 at expiration. The short 132/134 call vertical is profitable with the underlying stock below the 132.61 breakeven. It starts to lose money above there and experiences its maximum possible loss of 1.39 with the underlying at or above 134 at expiration. The long call spread achieves its maximum profit above 132.00, but the short call spread realizes its maximum loss above 134.00. That $2.00 range is pretty small for a $130 stock, and we haven't even factored in the cost of the butterfly yet.

That's a whole lot of numbers. Let's look at the payoff chart. This 130/132/134 call butterfly cost 0.19 and we can see this payoff chart in Figure 11.3. Note that we've added the constituent vertical spreads to the chart so you can see how they interact with each other.

The fact that a long butterfly shows a loss over a very large range of strike prices, both above and below the spread, is probably the biggest difference between a butterfly and a simple long vertical spread. In a simple long vertical spread, the market cannot move too far. If the stock rallies, then at some point, a long call vertical spread will have achieved its maximum profit, and that profit at expiration will never decrease as long as the stock price remains above the call spread. That's not the case

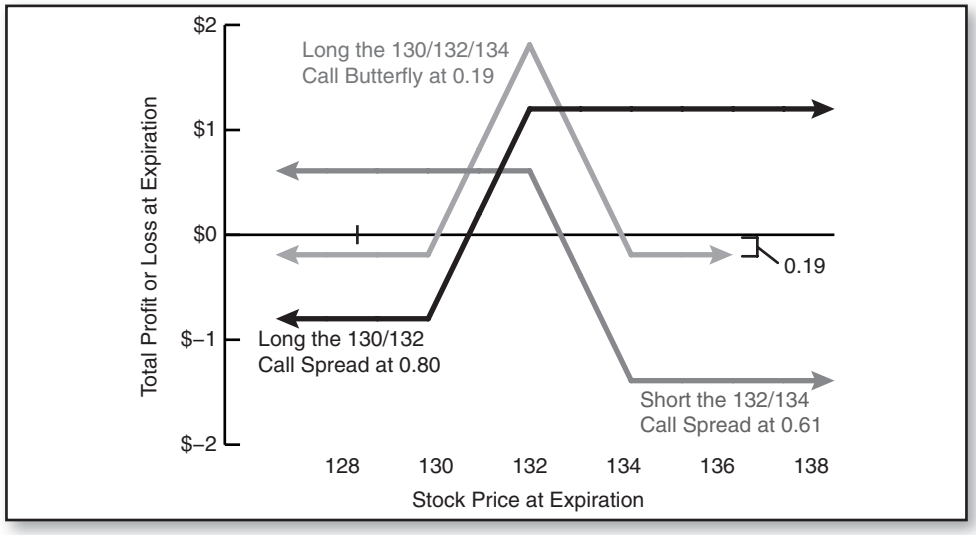


FIGURE 11.3 A Butterfly Is Really Just a Spread of Two Vertical Spreads

with a call butterfly; the market can move too far if we've bought a butterfly. You saw this in Figure 11.3 after the stock got above 134.00.

Similarly, if the stock drops, then at some point the long vertical put spread will have achieved its maximum profit and that profit will never decrease as long as the stock price remains below the put spread. That's not the case with a put butterfly. The price of the underlying stock can drop too far for a long put butterfly. We'll look at put butterflies more closely later in this chapter.

For a long call butterfly, you're long a vertical call spread, which will increase in value as the underlying stock appreciates, and you're short a slightly different call vertical that is a little further out-of-the-money and will lose money, since we're short it, as the underlying stock appreciates. If the price of the underlying stock drops, then the price of the vertical spread you're long will drop, which is bad, but the price of the vertical spread you're short will drop as well, and that's good. The result is that the long call vertical and the short call vertical are working against each other. One will have realized its maximum profit, and one will have realized its maximum loss if the underlying stock moves enough, regardless of direction.

Let's look at the same butterfly that we saw in Figure 11.3, but let's examine specifically how the underlying price can move too far for our butterfly to be profitable. We can see this in Figure 11.4.

The lower breakeven point for our call butterfly is 130.19 and the maximum profit is achieved at 132.00. Since the underlying stock was at 128.07, this butterfly needs the underlying stock to rally, and you'd buy it only if you were bullish (however, as with other spreads, you don't have to be completely bearish in order to sell

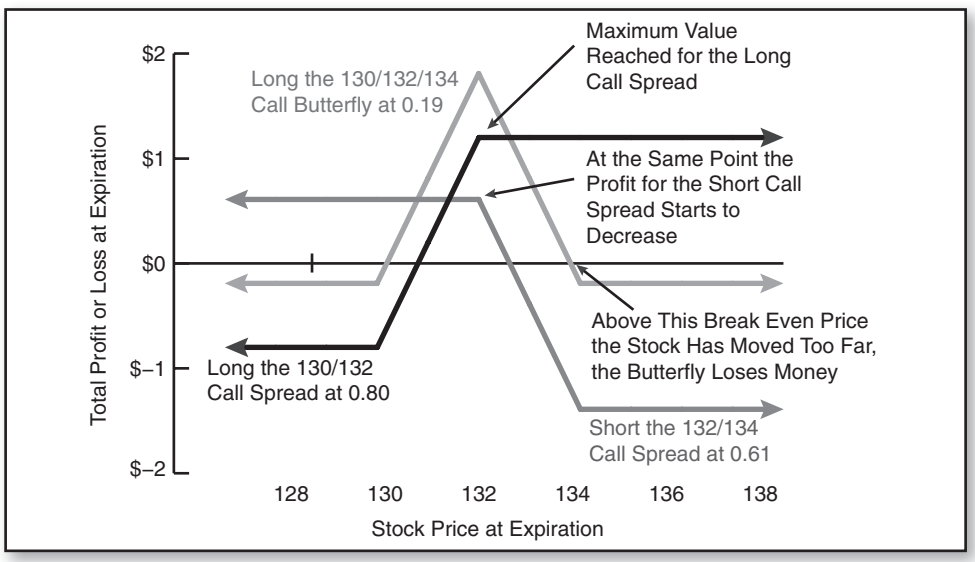


FIGURE 11.4 The Underlying Can Move Too Far for Our Long Call Butterfly

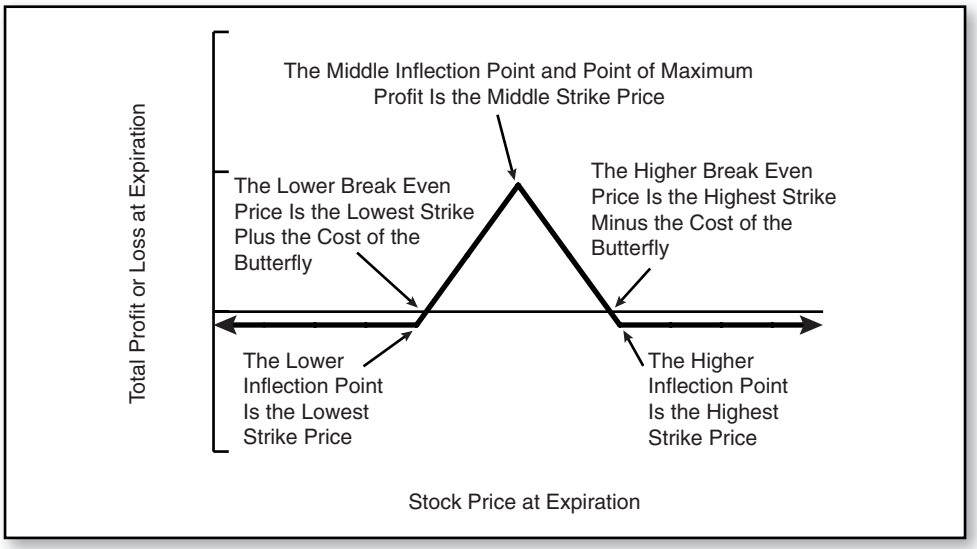


FIGURE 11.5 Generic Breakeven Points for a Long Butterfly

it; you might very well sell it if you were either bearish or neutral but more about selling butterflies later). And how much does the underlying have to rally at expiration? It has to rally at least to 130.19, which is the lower strike price, 130.00, plus the cost of the butterfly, 0.19, but can't rally above 133.81, which is the higher strike price, 134, minus the cost of the butterfly, to at least break even.

What are all the important breakeven and inflection points, and how can we calculate them easily, without building the sort of profit-and-loss table we did previously every time we're thinking about trading a butterfly? Figure 11.5 shows the generic breakevens and the inflection points for every long butterfly, whether call or put.

So a call butterfly is simply one vertical call spread versus another vertical call spread. As we'll see later, a put butterfly is simply one vertical put spread versus another vertical put spread. What if we sell that first vertical call spread and buy the vertical call spread that is farther from at-the-money? Let's take another look at the options we saw earlier and see how we can turn things around a little. In Figure 11.6 we're creating different call verticals and arranging them differently.

This time we constructed a slightly different butterfly by selecting different vertical spreads. We'll sell the 131/134 call vertical (selling the 131 call at 2.56 and buying the 134 call at 1.57), collecting 0.99 (2.56 – 1.57), and buy the 134/137 call vertical (buying the 134 call at 1.57 and selling the 137 call at 0.94), paying 0.63 (1.57 – 0.94). By selling this butterfly, we will have collected a net of 0.36 (0.99 – 0.63). What does this profit and loss look like over a range of prices for the underlying stock at expiration? We see that in Figure 11.7 and notice that we're not looking at this butterfly as if it were composed of three options, but rather we're looking at it as we should—as if it were composed of two vertical spreads.

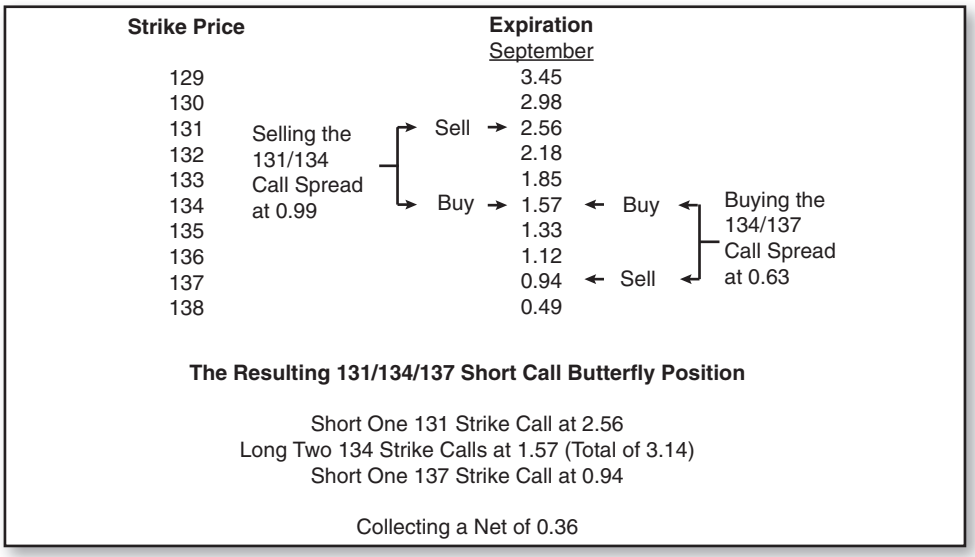


FIGURE 11.6 Selling a Call Butterfly

We're selling the butterfly and as with nearly any spread or combination, we see the maximum potential profit is the premium collected, 0.36 in this case. We keep that 0.36 no matter where the underlying is at expiration and that's our profit with the underlying stock below 131.00 or above 137.00 at expiration. Once the stock gets above 131.00, our profit starts to trail off until the stock gets to the 131.36 breakeven. From 131.36 to 136.64, this short butterfly is a loser with the maximum potential loss of 2.64 realized with the stock at precisely 134.00 at expiration. The

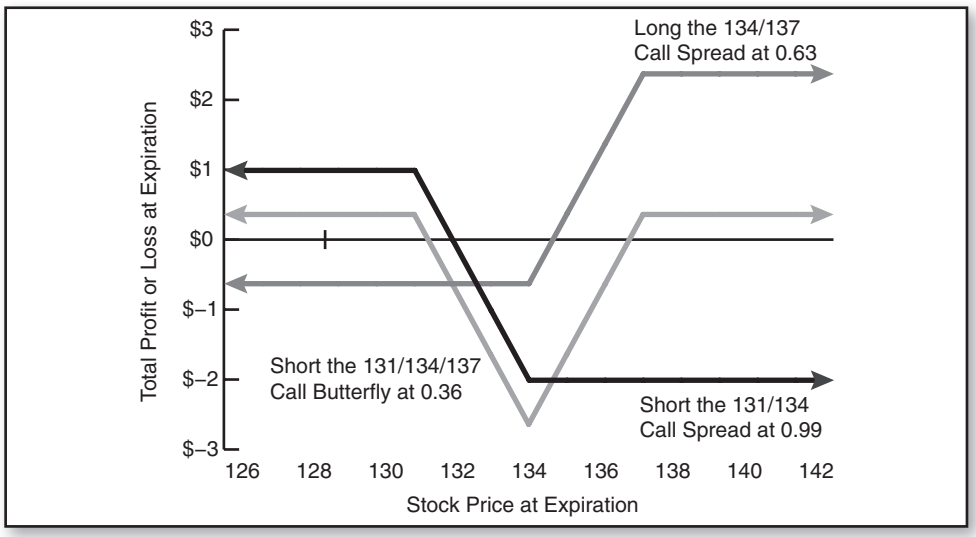


FIGURE 11.7 Payoff for Our Short Call Butterfly

loss trails off as the stock rallies above 134 until it reaches the upside breakeven of 136.64 and above that level the short butterfly is profitable again before reaching the level of maximum profit again when it's above 137.00.

Buying and Selling Butterflies—The Terminology

As you've probably figured out, if we're buying the outside strikes, the "wings" of the butterfly, and selling twice as many of the inside options, the "body" of the butterfly, then we're buying the butterfly. This is consistent with our discussion of buying and selling any other spread or combination because if we're buying the wings, then we're going to pay for the butterfly, and what we pay will be our maximum risk. However, if we sell the wings, the outer strikes, and buy twice as many of the body, the middle strike, then we're going to collect premium, and this is logical because the vertical spread that we're selling, the one that is closer to at-the-money, is going to be more expensive than the vertical spread that we are buying, the one that is farther out-of-the-money. What we collect will be our maximum profit as it is with any other spread we sell. This assumes that our butterfly is out-of-the-money and symmetrical, that the width of the two vertical spreads is identical. You might occasionally want to use a slightly asymmetrical butterfly, and if you have a good reason for selecting the specific strike prices, then more power to you. You'll just have to do the math to understand whether you'll pay or collect and what the maximum profit and loss is. This sort of asymmetrical butterfly is sometimes called a *broken butterfly* and is often used to get "long" a butterfly without paying out any cash.

Put Butterflies

Put butterflies are nearly identical to the call butterflies we've seen; we'll buy (or sell) one put vertical spread and sell (or buy) a similar put vertical spread. Let's look at another underlying stock and see how we might create a put butterfly. We see these put prices in Figure 11.8.

To initiate this put butterfly we sold the 60/65 put spread at 0.71 (by selling the 65 put at 1.30 and buying the 60 put at 0.59) and bought the 65/70 put spread at 1.49 (by buying the 70 put at 2.79 and selling the 65 put at 1.30). We're long the 60/65/70 put butterfly at 0.78. What does this payoff chart look like? We see that in Figure 11.9.

The first thing to notice is that the general shape of the payoff and risk of the long put butterfly is identical to the long call butterfly we looked at earlier. In this case the stock has to drop because we bought a put butterfly and the underlying stock was at 72.47, which was above our breakeven prices (remember there are two breakeven

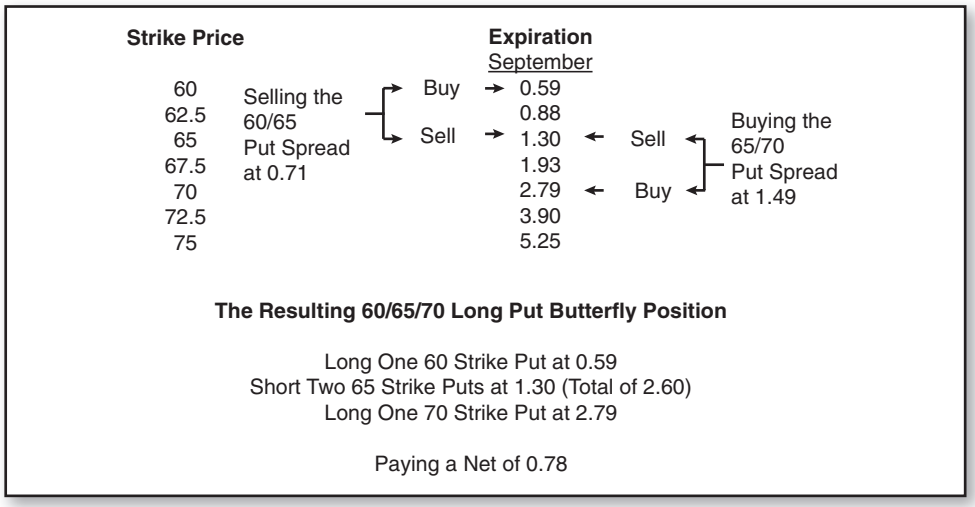


FIGURE 11.8 Put Options and Buying a Put Butterfly

prices for each butterfly) and maximum profit level, but that just means that we have the same sort of affirmative directional outlook, we think the stock is going to move in a particular direction, in this case that direction is lower. This put butterfly realizes its maximum potential profit of 4.22 (the 5.00 width of each spread minus the 0.78 cost of the butterfly) with the stock precisely at 65.00 at September expiration. The breakeven points are 60.78 and 69.22. Above 69.22 the butterfly loses money, and above 70.00 it loses the maximum possible, the 0.78 we paid for the butterfly.

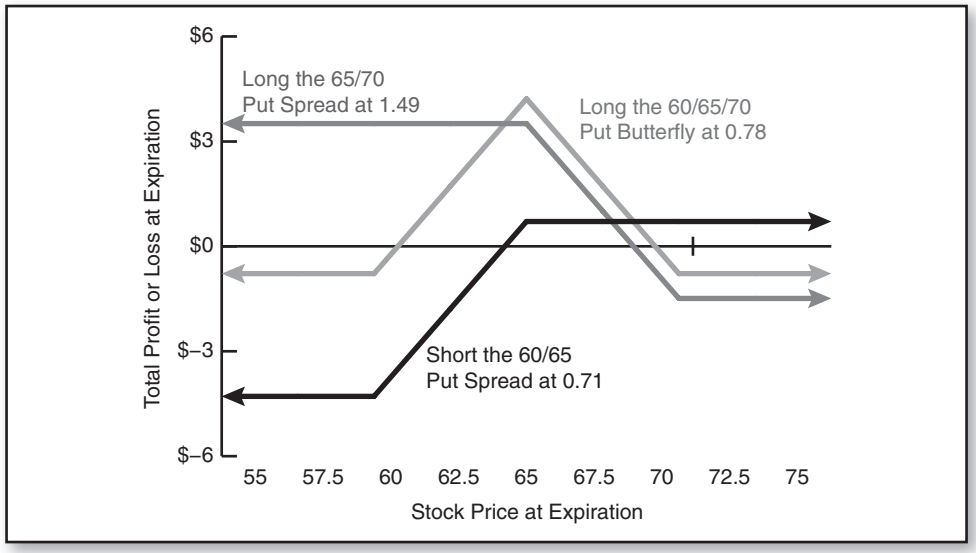


FIGURE 11.9 A Long Put Butterfly Is a Spread Made Up of Two Put Vertical Spreads

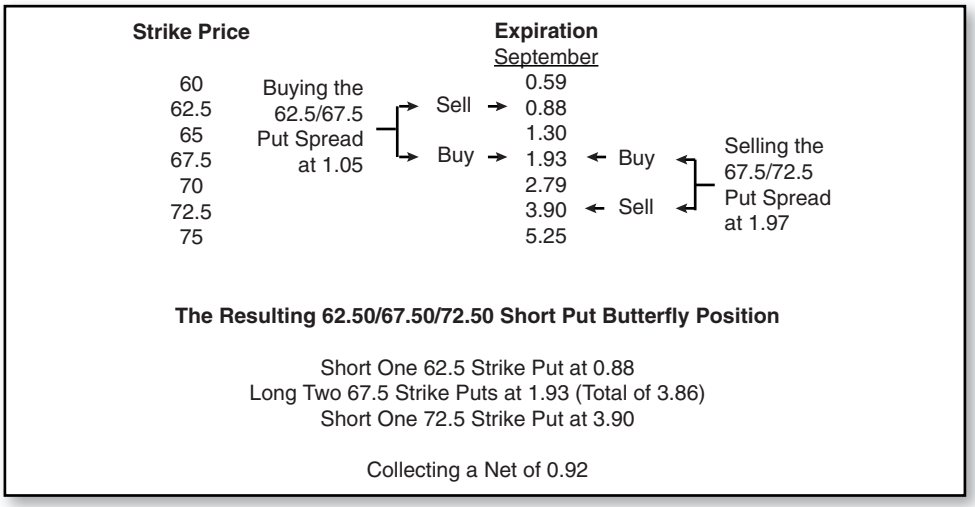


FIGURE 11.10 Put Options and Selling a Put Butterfly

Below 60.78 this long butterfly loses money because the stock has dropped too far. This is the risk in buying a butterfly—the stock can move too much and thereby wipe out our gains. It is the price paid for a butterfly costing so much less than a simple vertical spread. Below 60.00 this put butterfly loses the maximum possible, the 0.78 that we paid for it.

Selling a put butterfly is very similar to selling the call butterfly that we saw previously. Let's take another look at those put option prices and a put butterfly that we might sell. We see such a short put butterfly in Figure 11.10.

If we buy the 62.5/67.5 put spread by buying the 67.5 put at 1.93 and selling the 62.5 put at 0.88, then we'll pay 1.05. If we sell the 67.5/72.5 put spread and collect 1.97, then we will have sold the 62.5/67.5/72.5 put butterfly and collected a net of 0.92. Although it's easy to get turned around because these are put spreads, we know that we're short the butterfly because we collected money and because we're short the "wings," the 62.5 and 72.5 puts in this case. What does this payoff chart look like? We see that in Figure 11.11.

Our maximum profit is the 0.92 that we collect and we realize that with the underlying stock above 72.50 or below 62.50 at expiration. The maximum loss is 4.08, but that's realized only if the underlying stock is at precisely 67.50 at expiration.

Butterflies Prior to Expiration

So far, we've looked at our butterfly's outcomes at expiration but since the underlying stock can move too far if we're long a butterfly, and because the zone of maximum profit or near maximum profit at expiration is so small for a long butterfly, it's

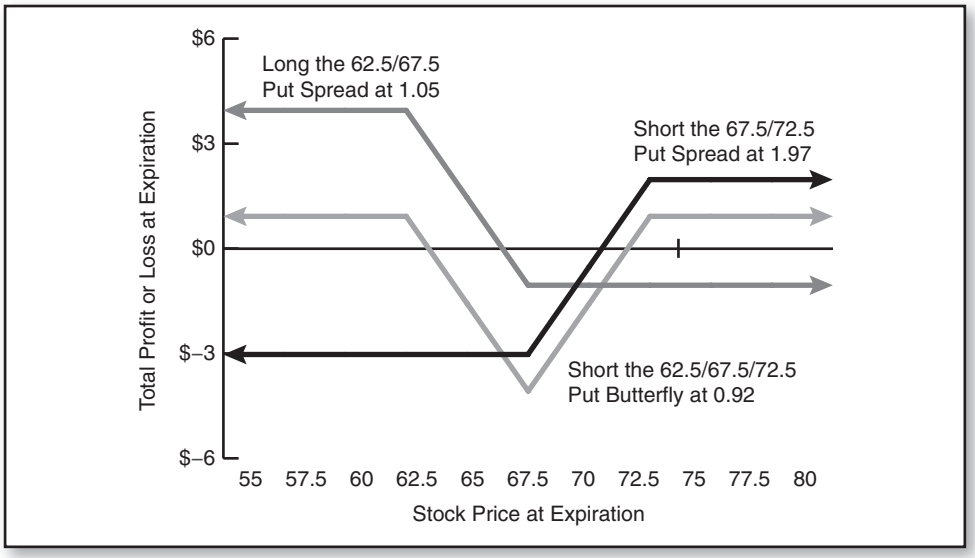


FIGURE 11.11 Payoff for the Short 62.5/67.5/72.5 Put Butterfly

often necessary to close the butterfly position prior to expiration to realize a reasonable profit and to make certain our profit doesn't turn into a loss. We'll never realize the maximum profit if we take the trade off before expiration.

A butterfly can move too far, so the maximum profit is realized only with the underlying stock precisely at that middle strike precisely at expiration, but if we enter a long butterfly understanding that we'll likely take it off prior to expiration and that we'll not realize that theoretical maximum profit then we can size our trade in a way that's appropriate and then take it off when it's done what we wanted it to do without feeling that we're foregoing a bunch of potential profit.

Similarly, you might want to close your short butterfly position prior to expiration if it shows a profit because the remaining value, the additional profit we'll make if we hold the short butterfly to expiration, can be very small in relation to the maximum potential loss if the underlying stock moves in the wrong direction.

We saw in Chapter 3 that the payoff line prior to expiration is more rounded than the linear result we get at expiration. Let's look at the same sort of payoff lines prior to expiration for some butterflies. We see these in Figure 11.12.

Figure 11.12 assumes that we bought a hypothetical 105/110/115 call butterfly when there were 60 days to expiration and the underlying stock was at 100.00. As you can see, we paid 0.54 for our butterfly so that's our maximum loss. If the stock was at 110.00 at expiration then we'd stand to make 4.46 (5.00 – 0.54). Our butterfly is clearly bullish, our lower breakeven is 105.54, so we need the stock to rally to just break even at expiration and any of these time frames require the stock to rally in order to realize a profit. But if the trade is bullish, then shouldn't it show at least

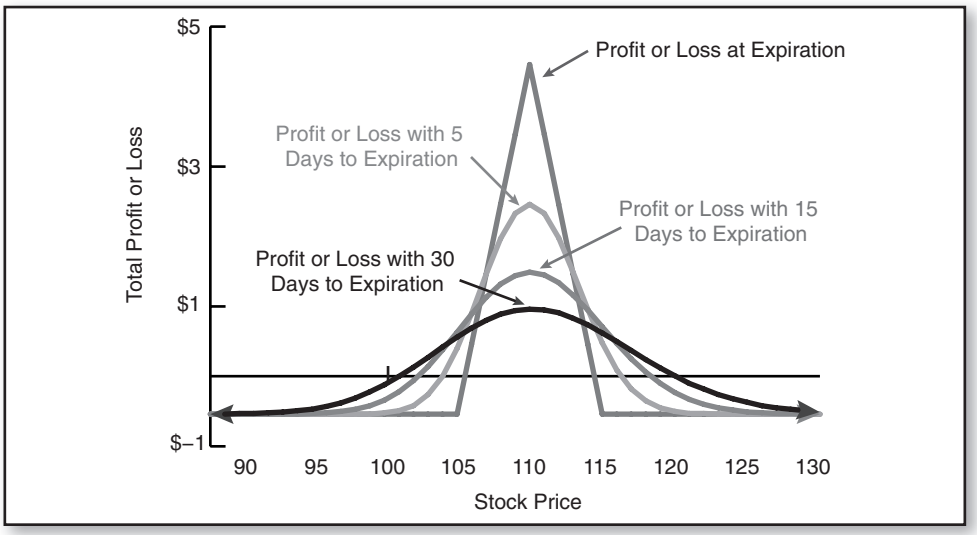


FIGURE 11.12 Profit and Loss for a Butterfly Prior to Expiration

some profit if the underlying rallies after we buy the butterfly, even if there's quite a bit of time to expiration? It certainly should, and it does.

As with all of the payoff charts, these preexpiration payoff charts are much more rounded and the preexpiration profit and loss lines gradually become more linear, more like the completely linear profit and loss line at expiration, as expiration nears. The flattest curve is this butterfly with 30 days to expiration, the steepest curve, other than the expiration payoff, is this butterfly with 5 days to expiration and the middle curve is this butterfly with 15 days to expiration. As you can see, the shape of the curve is morphing into the linear chart that is the profit or loss at expiration.

At 30 days to expiration our butterfly is clearly bullish, if the underlying hasn't moved from the 100.00 it was at when we executed our butterfly, we still need it to rally in order for our butterfly to be profitable, but it doesn't have to rally much. With just 30 days to expiration the butterfly that we paid 0.54 for would break even; that is, it would be worth the 0.54 we paid, if the underlying were at about 101.00. Even though 30 days have passed, we need the underlying to rally by only 1 percent to get to breakeven. But as time passes, that lower breakeven price continues to increase and the speed by which it increases accelerates. From 60 days to 30 days it increases about 1 percent, from 60 days to 15 days it increases 2.35 percent, from 60 days to 5 days it increases 4.00 percent, and from 60 days to expiration it increases the complete 5.54 percent.

The same is true for the upper breakeven. With 30 days to expiration it's about 120.00, with 15 days to expiration it's about 118.50, with 5 days to

expiration it's about 116.30, and at expiration it is 114.46. Notice again that this upper breakeven level is moving toward the 114.46 upper breakeven that the butterfly has at expiration and that the speed of that movement increases as expiration nears.

The profitable range is obviously broader with more time to expiration; it covers a wider swath of underlying prices as we can see by these breakeven prices and by the fact that the profitable range narrows as time to expiration nears. This wider profit range is great; it means that our margin of error regarding the price of the underlying is larger. The price of the underlying still has to move, in the case of our long call butterfly it has to move higher, but with more time to expiration it doesn't have to move as much. We see that with everything else being equal the breakeven at 30 days to expiration is 101.00. The price of the underlying can still move too much, but with more time to expiration, it has to move more in order to move too much. With substantial time to expiration (30 days in this case), the underlying doesn't have to move all the way to that 105.54 breakeven in order to generate a profit and can still show a profit if it's moved past the upper breakeven of 114.46. Again, refer to Figure 11.12 and notice how the breakeven levels approach the middle strike price—they narrow—as time passes and expiration approaches. But what do we give up for that increased margin of safety, for the fact that the underlying doesn't have to move as far to show a profit but can move more and still show a profit? The answer is lower maximum profit. The maximum profit is lower when the time to expiration is greater. With the underlying at 110.00 with 59 days to expiration, our 105/110/115 butterfly would be worth 1.10 versus the 5.00 it would be worth at expiration.

As you can see from our hypothetical butterfly, the maximum profit with 30 days to expiration is pretty small when compared to the other time frames. With the underlying at 110.00—regardless of the time to expiration, the maximum profit is still going to be realized with the underlying at the middle strike price—the butterfly with 30 days to expiration shows a profit of about 0.96; we have not quite doubled our initial 0.54. With 15 days to expiration the butterfly shows a profit of about 1.49; we have not quite tripled our initial 0.54. With 5 days to expiration the butterfly shows a profit of 2.45; we have not quite quintupled our initial 0.54.

This shape to the profit or loss chart is the reason that users of butterflies should be thinking of this as a trade that needs to be tended, probably taken off before expiration, and as the sort of trade that might double or triple your money but not as the sort of that that will turn your 0.54 (the initial cost of this butterfly) into 4.46 (the maximum potential profit if the underlying stock is precisely at 110.00 at expiration) because the odds of the underlying stock being at precisely 110.00 at expiration are extremely remote. The math says that likelihood is just less than 0.05 percent or about 1 in 2,000.

Butterflies and Your Market Expectations

As we've just seen, a long butterfly is made with a specific market outlook, long an out-of-the-money call butterfly is a bullish trade, long an out-of-the-money put butterfly is a bearish trade. However, a short butterfly, like almost every other short option position, isn't a speculation that something will happen—it's a speculation that the something won't happen. A long call butterfly assumes the market will rally. A short call butterfly assumes the market will not rally, at least not very much, so it makes money if the market drops, moves sideways, and, depending on the strikes, even if the market rallies a little as well as if the market rallies "too much" and is above the highest strike price at expiration. A short call butterfly is a speculation that the market won't be between the strike prices of the wing options at expiration.

Similarly, a long put butterfly assumes the market will drop and a short put butterfly assumes the market will rally, move sideways, drop only slightly, again depending on the particular strike prices, or drop far enough to be below the lowest strike.

We've seen how much the market must move for our long butterfly to be profitable. We've seen how much the market can move for our long butterfly to stay profitable, that is, how far is too far. We've see how the market can move for our short butterflies to be profitable. Now that we know these price levels, how can we figure out the likelihood that the underlying stock will be at or beyond those price levels? That likelihood is the delta we discussed earlier.

Let's take another look at that hypothetical call butterfly and determine the likelihood that the underlying stock will at least get to the lower breakeven without going above the higher breakeven. Figure 11.13 shows the profit and loss chart with the

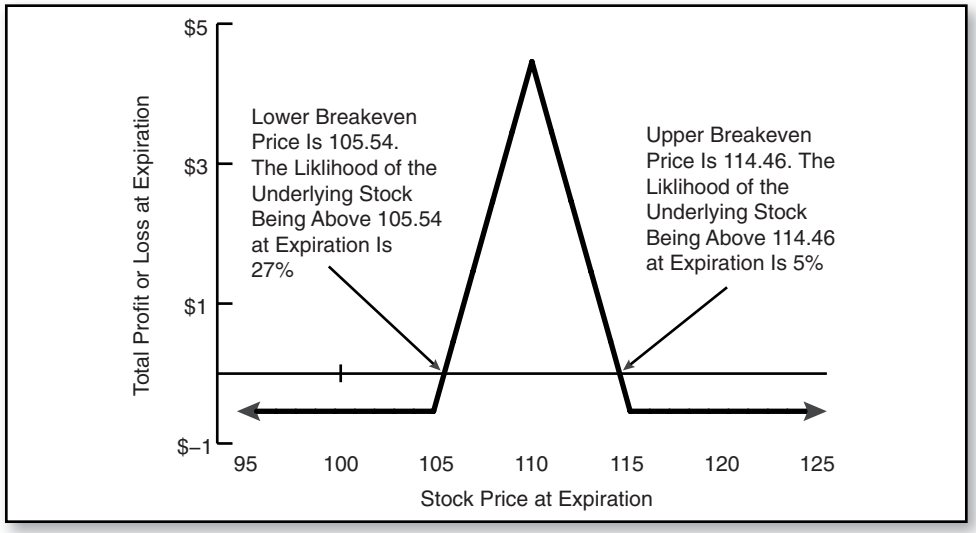


FIGURE 11.13 Butterfly Breakevens and Those Likelihoods

breakevens and the likelihoods that the underlying stock will be above those breakeven levels.

The delta of an option is, among other things, the likelihood that it will be in-the-money at expiration. Of course, no actual options exist with strike prices precisely equal to our breakeven prices, but we can use the tools at www.OptionMath.com to pretend there are such strike prices and to calculate the deltas for those fictional options. If we do that, then we find that the delta of a 60-day (the time to expiration when this theoretical butterfly was priced) call option with a strike price of 105.54 (the lower breakeven price) is 27. Thus, the likelihood that the underlying stock, which is at 100.00 now, will be above the lower breakeven price of 105.54 at expiration is 27 percent. The delta of the 60-day call with a strike price of 114.46 (the higher breakeven price) is 5, so what is the likelihood that the underlying stock will be in the range between those two breakeven prices? That's 22 percent (27 percent – 5 percent). The odds of this butterfly being profitable at expiration are 22 percent or about 1 in 5. That's not very likely, and it's another indication that you should expect to close your butterfly position before expiration when there's a wider range of profitable prices. But it also recognizes that a long butterfly generates enormous leverage. Our hypothetical butterfly cost 0.54 and could be worth 5.00 at expiration, which would generate a profit of 4.46, an 825 percent profit. And the odds of at least quintupling our money? About 11 percent. We see these likelihoods in Table 11.2.

What if we turned this butterfly around and sold it at 0.54? The odds of the stock being between 105.54 and 114.46 at expiration are still 22 percent. It doesn't matter if we're long or short the butterfly—the odds are the same.

So far we've seen that out-of-the-money butterfly spreads have some specific market outlook; a long butterfly expects the market to move in a particular direction by a particular amount while a short butterfly expects it to do the opposite which means move the opposite direction, not move at all, or move too much. But the question becomes how out-of-the-money is our butterfly, and how far do we expect the underlying stock to move or not move?

Two specifics affect our butterfly: how wide the butterfly is and how out-of-the-money it is.

TABLE 11.2 **Our Call Butterfly and How Likely Is It to Be Really Profitable**

Outcome at Expiration	Relevant Price at Expiration	Likelihood
Maximum loss realized	< 105 or > 115	76% (71% + 5%)
At least break even	> 105.54 and < 114.46	22% (27% – 5%)
Double our money	> 106.08 and < 113.92	19% (25% – 6%)
Quintuple our money	> 107.70 and < 112.30	11% (20% – 9%)

TABLE 11.3 Some Call Butterflies and the Odds of a Profit

Butterfly	Cost	Lower Breakeven	Upper Breakeven	Likelihood Underlying Is between Breakevens at Expiration
100/105/110	0.94	100.94	109.06	32%
101/106/111	0.86	101.86	110.14	30%
102/107/112	0.78	102.78	111.22	28%
103/108/113	0.70	103.70	112.30	26%
104/109/114	0.62	104.62	113.38	24%
105/110/115	0.54	105.54	114.49	21%
106/111/116	0.47	106.47	115.53	19%
107/112/117	0.40	107.40	116.60	17%
108/113/118	0.34	108.34	117.66	15%
109/114/119	0.29	109.29	118.71	13%
110/115/120	0.24	110.24	119.76	11%
111/116/121	0.20	111.20	120.80	9%
112/117/122	0.16	112.16	121.84	8%
113/118/123	0.13	113.13	122.87	6%
114/119/124	0.10	114.10	123.90	5%
115/120/125	0.08	115.08	124.92	4%

As the long call butterfly gets further from at-the-money the lower breakeven point gets further from at-the-money, the likelihood that the underlying will get at least to that lower breakeven point becomes lower. That means the butterfly should cost less, assuming the maximum potential value remains the same. If the potential value remains unchanged but the likelihood of at least breaking even drops then the trade should cost less. Let's see if that's how it works out. Table 11.3 shows the theoretical butterfly prices using the same data we used for our 105/110/115 call butterfly. There were 60 days to expiration, the underlying stock was at 100.00 and the implied volatility for all the options was 20 percent.

As you can see, as the butterfly gets farther from at-the-money, the cost goes down but the likelihood of the butterfly at least breaking even drops as well. You can see this in Figure 11.14.

A trader long a butterfly wants it to achieve its maximum value at expiration. A trader short a butterfly wants it to have value of zero at expiration. The important element is that the cost stays pretty closely tied to the likelihood of the butterfly having any value at expiration. There's not any one of those trades that's a much better deal than any others, particularly once you've factored in the execution cost including the width of the bid/ask spread. Simply said, the farther the butterfly is from at-the-money, the farther it needs to move to break even. A long call butterfly that is farther out-of-the-money is more bullish. A long put butterfly that is farther out-of-the-money is more bearish.

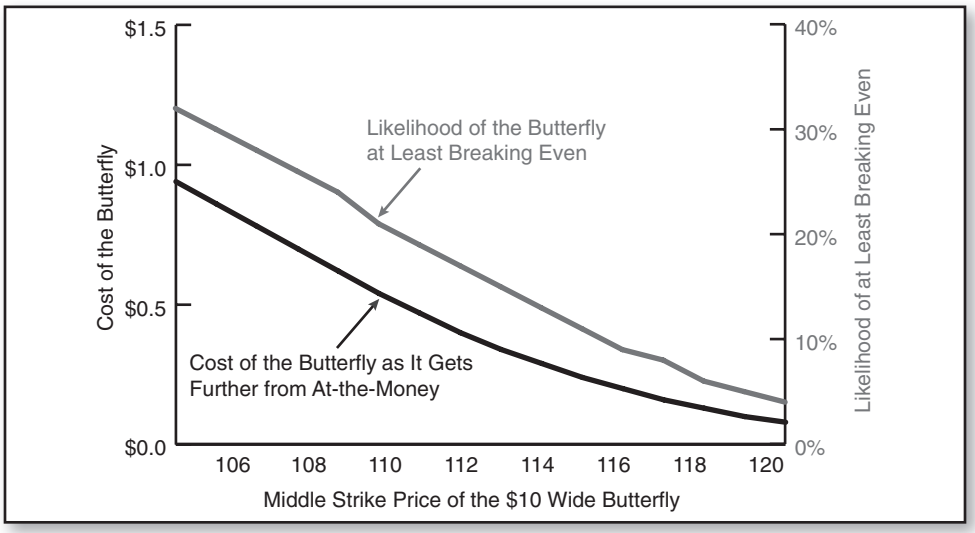


FIGURE 11.14 Distance from At-the-Money, Cost, and Likelihood of Breaking Even

Broken Butterflies

So far we've examined symmetrical butterflies exclusively. These were all made up of two vertical spreads that had the same distance between the strike prices. The fact that the vertical spreads making up our butterfly are the same width—that is, they have the same distance between the strike prices—means that the spread that is closer to at-the-money is going to be more expensive than the one that is further from at-the-money. This is what generates the potential profit for a butterfly seller, but it also means the butterfly buyer has to pay the net cost and the butterfly buyer ends up with a trade structure that has a fairly narrow profit window and a miniscule window to realize the maximum profit. Since a butterfly is a spread of two vertical spreads, couldn't we change the width of the spread that is further out of the money, thereby collecting more for selling it as part of a long butterfly, and reducing or eliminating the cost of the entire trade? We'd end up with a trade that wasn't symmetrical, which is why it's often called a broken butterfly.

While the buyer of a regular, symmetrical butterfly loses all of the premium paid if the underlying stock isn't between the strike prices of the wings, the buyer of a broken butterfly can often put the trade on without paying any net premium. But we know there's no free lunch, so what's the downside of a broken butterfly if it doesn't cost us any premium? The potential loss is greater if the underlying makes a big move, a move that extends beyond the most distant strike price. In Figure 11.15, we look at some call option prices in XOP, the crude oil and natural gas exploration and development exchange-traded fund and examine a broken butterfly we might execute.

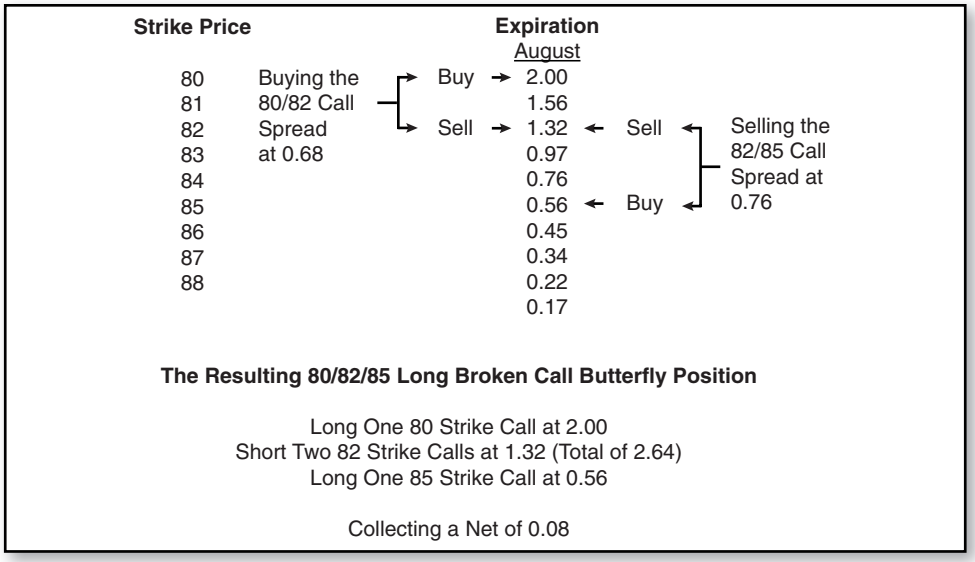


FIGURE 11.15 Call Options and Buying a Broken Call Butterfly in XOP

This is a butterfly because we're buying a nearby vertical call spread—the 80/82 in this case—and selling a further out-of-the-money vertical call spread— the 82/85 call spread in this case—that shares a strike with our first call spread. It is a broken butterfly rather than a traditional butterfly because this butterfly is made up of spreads that aren't the same width; the spread we're buying is $2 wide, while the spread we're selling is $3 wide.

Observant readers will note that we're buying this broken butterfly because we're buying the outer strikes, the wings, but we're also collecting a little net premium. If we're buying the wings we're buying the butterfly and while we might collect some premium in doing so, we're paying elsewhere, probably in the fact that we've changed the risk, the maximum potential loss, as we'll see. This is one of the very few instances when we might say we're buying a spread while collecting premium.

What will be the profit or loss for this broken butterfly at expiration? Previously, we've built a complete profit and loss table and generated the results for a bunch of strike prices or we've created a payoff chart. Those can both be helpful, and we'll create a traditional payoff chart later, but instead of creating a profit and loss table with every single strike, let's create a smarter profit and loss table with only the inflection points. We see this in Table 11.4.

As long as XOP is below 80.00 at expiration, we'll get to keep the 0.08 we initially collected, all the options will expire worthless, and we can reevaluate. With XOP at 82.00 at option expiration, the 80/82 call spread will have achieved its maximum value of 2.00, the 82/85 call spread will be worthless, and we will also have our original 0.08. At the body of the broken butterfly, our

TABLE 11.4 Profit and Loss for Our Broken Call Butterfly at the Inflection Points

Inflection Point	80/82 Vertical Call Spread Profit/Loss	82/85 Vertical Call Spread Profit/Loss	80/82/85 Broken Butterfly Profit/Loss
80.00	–0.68	0.76	0.08
82.00	1.32	0.76	2.08
85.00	1.32	–2.24	–0.92

profit will be 2.08, which is the net we originally collected plus the width of the first spread.

Once XOP has passed beyond the most distant strike, the 85 strike in this case, we will sustain our maximum potential loss: we'll lose more from shorting the 82/85 call spread than we'll make from buying the 80/82 call spread, and the 0.08 we originally collected won't make up the difference. Our loss will be the difference in the widths of the spreads—1.00 in this case (3.00 width minus 2.00 width)—less/plus the initial net premium collected/paid.

Let's extend the prices we look at to make certain this 0.92 loss is our maximum loss and see where we sustain that loss. You can see this in Figure 11.16.

The maximum loss for our broken butterfly is 0.92, and that occurs with XOP at or above 85.00 at option expiration. This greater potential loss is the price we pay for the fact that we actually collected 0.08 when we initiated this trade rather than paying as we would with a traditional, symmetrical butterfly.

In order to truly evaluate this broken butterfly, we have to compare it to the generic butterfly we might have executed. If we'd bought the 80/82/84 call butterfly,

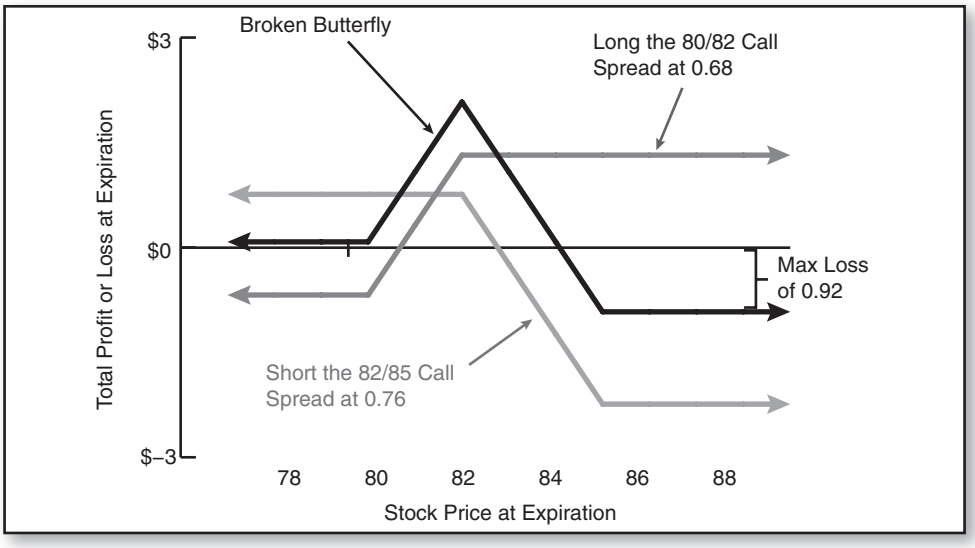


FIGURE 11.16 Broken Call Butterfly in XOP

we would have bought the 80/82 call spread for 0.68 (so far the two trades are identical) and would have sold the 82/84 call spread for 0.56 (this is where the two trades differ), meaning we pay a net of 0.12 for this traditional butterfly versus collecting 0.08 for buying the broken butterfly. The difference between the two trades is 0.20, and that makes sense, as this was the difference in price between the 84 strike call which was trading at 0.76 and the 85 strike call which was trading at 0.56.

Since we would have paid 0.12 for the traditional butterfly, that would have been our maximum loss, and we would have lost that full amount with XOP above 84.00 or below 80.00 at option expiration.

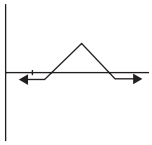
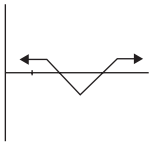
Instead, with the broken butterfly we collect 0.08, but our maximum loss is 0.92 and we sustain that with XOP above 85.00 at option expiration. This leads to the question, is the extra 0.20 we save worth the added risk?

Let's use the tools at www.OptionMath.com to determine the likelihood that we'll lose that entire 0.92. If we do that math, we find that the delta for this 85 strike call is 19, meaning there's a 19 percent chance we lose the full 0.92. It's no accident that 19 percent of 0.92 is 0.175, or almost exactly the 0.20 we're saving (the difference between 0.20 and 0.175 is generated by the bid/ask spreads of all the options; for our purposes the numbers are essentially equal). So are you better off buying the broken butterfly or the traditional butterfly? The math says you're equally well off, but your insight into what XOP is going to do, your ability to initiate the trade effectively (it's made up of 3 legs and 4 options so execution is going to be key), and your ability to manage the trade prior to expiration will make the difference.

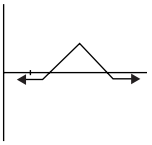
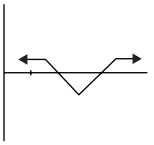
You could apply the same principle and generate a broken put butterfly that could be initiated for no net premium or that would generate a small net credit. By buying a put spread and then selling another put spread that is both wider and more out-of-the-money, you'll spend less money up front, and maybe generate that small credit, but face more risk if the underlying drops below the lowest strike price.

As such, broken butterflies, whether using calls or puts, are trades that expect a moderate movement in a specific direction—up for a broken call butterfly, down for a broken put butterfly—but think a large move that would take the underlying past the furthest strike by expiration is unlikely.

Call Butterfly Cheat Sheet

	Long Call Butterfly	Short Call Butterfly
Description	Long one OTM call Short two further OTM calls Long one even further OTM call	Short one OTM call Long two further OTM calls Short one even further OTM call
Example	ATM = 100 Long one 105 call Short two 110 calls Long one 115 call	ATM = 100 Short one 105 call Long two 110 calls Short one 115 call
Pay or Collect Premium	Pay	Collect
Needed Directionality		
Passage of Time without Market Movement	– –	+ +
Increase in Implied Volatility without Market Movement	+	–
Payoff Thumbnail Chart		
Maximum Risk	Cost of the butterfly	Difference between wing strike and body strike minus net premium received
Maximum Profit	Difference between wing strike and body strike minus net premium paid	Premium received
Breakeven Points	Lowest strike + Net premium paid Highest strike – Net premium paid	Lowest strike + Net premium paid Highest strike – Net premium paid

Put Butterfly Cheat Sheet

	Long Put Butterfly	Short Put Butterfly
Description	Long one put Short two further OTM puts Long one even further OTM put	Short one put Long two further OTM puts Short one even further OTM put
Example	ATM = 100 Long one 95 put Short two 90 puts Long one 85 put	ATM = 100 Short one 95 put Long two 90 puts Short one 85 put
Pay or Collect Premium	Pay	Collect
Needed Directionality		
Passage of Time without Market Movement	– –	+ +
Increase in Implied Volatility without Market Movement	+	–
Payoff Thumbnail Chart		
Maximum Risk	Cost of the butterfly	Difference between wing strike and body strike minus net premium received
Maximum Profit	Difference between wing strike and body strike minus net premium paid	Premium received
Breakeven Points	Lowest strike + Net premium paid Highest strike – Net premium paid	Lowest strike + Net premium paid Highest strike – Net premium paid

CHAPTER 12

Condors and Iron Condors

Vertical spreads were one of the very first structures we examined because they're incredibly versatile, particularly when we replaced an individual option with a vertical spread such as in a call spread risk reversal or in a put spread collar as well as when we combined two similar vertical spreads to create a butterfly. But if we buy the wings and sell the body of an out-of-the-money butterfly, then the underlying stock has to move in order for the butterfly to be profitable and the maximum profit is only achieved if the underlying stock is precisely at the middle strike price at option expiration. If the stock is even a little above or a little below that middle strike price, then the profit realized is less than the maximum potential profit. Since a butterfly is really two vertical spreads that share a middle strike price, what happens if we use two vertical spreads in the same sort of general configuration but select vertical spreads that don't share a central strike price meaning that the range of maximum profit is wider? That would be a condor. A *condor* is a spread of two vertical spreads. In a long condor, we'll buy one vertical spread and sell another vertical spread; the spread we buy is an in-the-money vertical spread meaning both legs are in-the-money, while the spread we sell is an out-of-the money vertical spread in that both legs are out-of-the-money. Let's look at some call options on Apple (AAPL) and see how we might use them to construct a long call condor. Since some of these options are in-the-money and have wide bid/ask spreads we'll use the average of the bid price and ask price. We see these options in Figure 12.1.

This long call condor is long an in-the-money call vertical spread, the 410/440 call spread (long the 410 call, short the 440 call), which cost 24.52. Since we're long

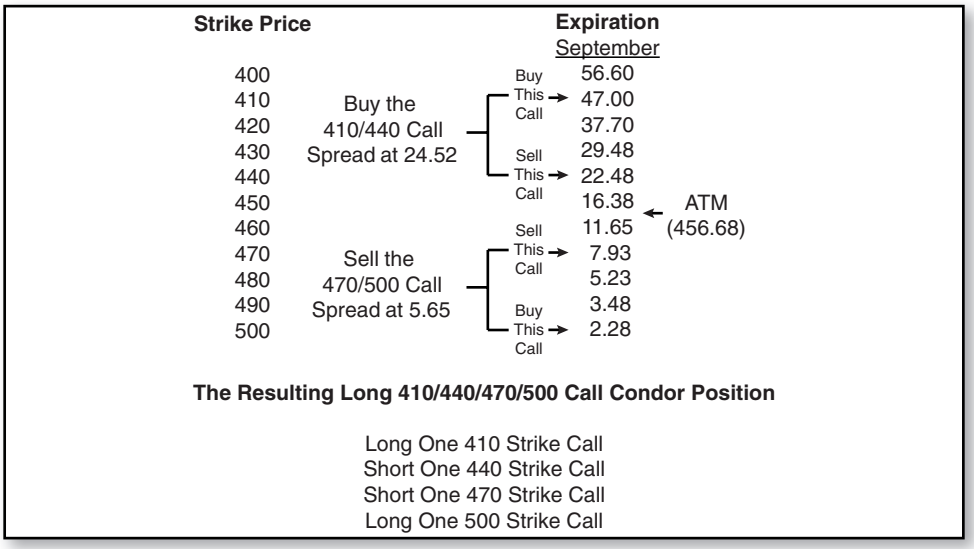


FIGURE 12.1 Buying a Call Condor in Apple

this call vertical and since it is in-the-money we want AAPL to stay near its current price of 456.68, rally, or decline only slightly while staying above 440.00, because those three outcomes result in this call vertical spread achieving its maximum value of 30.00 at expiration. If any of those three outcomes occur, no movement at all, a rally or a small decline, then we'll realize the maximum potential profit of 5.48 because AAPL will be above 440.00 at option expiration and the call spread we paid 24.52 for will be worth 30.00 at expiration. But a call condor is also short an out-of-the-money call vertical spread, the 470/500 call spread in this case, for which we receive 5.65. Since we're short this 470/500 call vertical and since it's out-of-the-money we want AAPL to stay near its current price of 456.68, decline, or rally only slightly while staying below 470.00 so that this call vertical expires worthless which it will do as long as AAPL is below the 470 strike at expiration. The in-the-money vertical spread needs little movement or a rally, the out-of-the-money vertical needs little movement or the stock to fall. In the net, a long condor needs the stock to experience little movement, we need the underlying stock, AAPL in this case to exhibit little volatility.

A long condor, either call or put, is a limited risk, nondirectional trade that we'd execute when we expected little volatility. A condor is a spread of two vertical spreads. It's similar to a butterfly, which is also a spread of two vertical spreads, but a butterfly uses only three strike prices with the middle strike, called the body, being shared by the two vertical spreads. A condor splits the body and instead uses two different strike prices. In the case of our Apple call condor the body was split into the 440 and 470 strike calls. A long condor wants the stock to be between

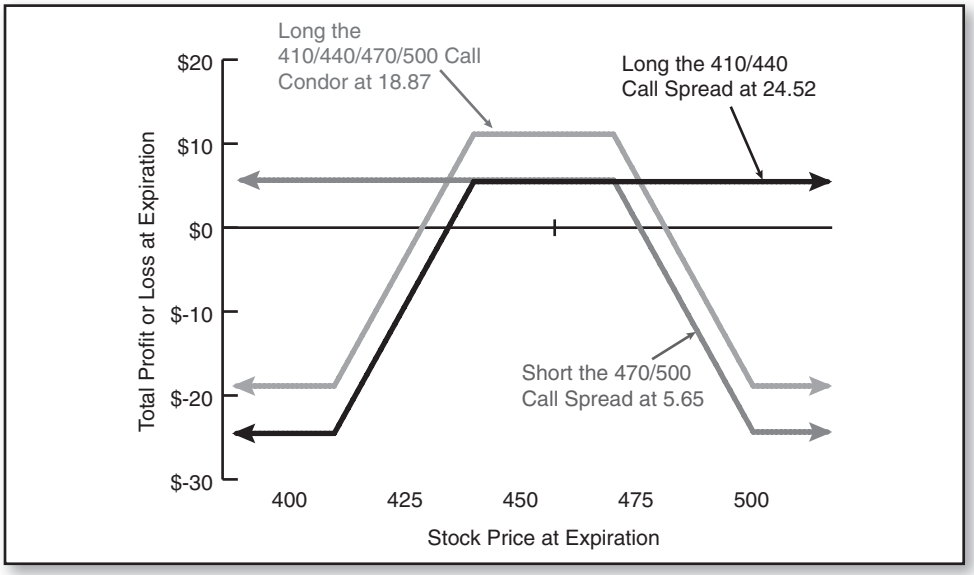


FIGURE 12.2 Long the Apple 410/440/470/500 Call Condor and the Constituent Vertical Spreads

the two vertical spreads, meaning between the two center strike prices, (440 and 470 in this example) at expiration. That's when it achieves its maximum profit because the long vertical will achieve its maximum value while the short vertical expires worthless. The two vertical spreads are usually the same width, measured as the distance between the strike prices, although changing the width of one spread slightly might align the condor with a particularly important point on the stock's chart.

The maximum risk for a long condor is the net premium paid, 18.87 for our September AAPL call condor. Let's look at the sort of payoff chart we're familiar with to see this and we'll chart the payoff as we should, as a combination of two call vertical spreads. We can see this in Figure 12.2.

Since Figure 12.2 shows both the component vertical spreads and the resulting condor it can be a little tough to figure out which is which. It's important to remember that a condor is a spread made up of two vertical spreads but let's look at just the condor for clarity's sake. See Figure 12.3, which also shows the important inflection points for this condor.

The cost of the condor is 18.87 so that's the maximum risk, the most the condor can lose. We'll realize that loss if the long call vertical, the lower vertical (the 410/440 call spread in this case) is worthless, meaning that all that we spent to buy it has been lost while the premium received for selling the short vertical, the upper vertical (the 470/500 call spread in this case), isn't enough to offset the loss. If the long call vertical expires worthless this AAPL call condor would lose 24.52

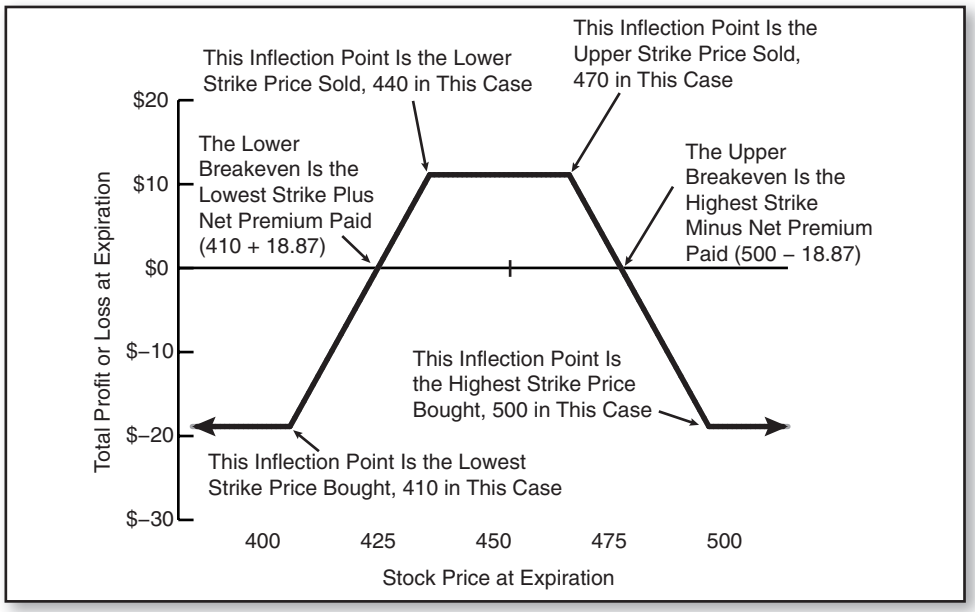


FIGURE 12.3 The AAPL Call Condor

by buying the lower vertical spread, the 410/440 call spread, but we only make 5.65 for selling the upper vertical, the 470/500 call vertical. The net loss is 18.87 (24.52 – 5.65).

We'll also realize that maximum loss of 18.87 if the short vertical is worth its maximum value of 30.00 meaning that we only collected 5.65 to sell a call vertical spread that is now worth 30.00, but the gain from buying the lower vertical spread, the 410/440 call vertical spread, is only 5.48. In this case, we lose 24.35 selling the 470/500 call vertical spread and only make 5.48 (30.00 – 24.52) from buying the lower call vertical spread. The net loss again is 18.87 (24.35 – 5.48). We'll lose the maximum value if the underlying stock is below the lowest strike price or above the highest strike price at expiration.

But what's the maximum profit? The maximum profit is the maximum potential profit from the call vertical we've purchased plus the maximum potential profit from the call vertical we sold. This maximum potential profit will be realized when the lower call vertical spread, the 410/440 call vertical we've purchased, is worth its maximum value of 30.00 at expiration meaning we've made the maximum profit possible in being long it, while the upper call vertical spread, the one we've sold, the 470/500 call vertical, expires worthless meaning we've made the maximum potential profit from being short it. This maximum profit will be realized when the underlying stock is between the vertical spreads at expiration meaning the underlying stock is between the two short legs. You can see this in Table 12.1.

TABLE 12.1 Our AAPL Call Condor and the Important Potential Outcomes

Outcome	Result	Where Does This Occur?
Max profit	+11.13 (5.48 + 5.65)	Between 440.00 and 470.00
Max loss	–18.87 (24.54 – 5.65)	Below 410.00 or above 500.00
Breakeven (lower)	0.00 (–5.65 + 5.65)	428.87
Breakeven (upper)	0.00 (5.48 – 5.48)	481.13

What are the likelihoods these outcomes will occur? What is the likelihood that the underlying stock will be between the two vertical spreads at expiration meaning that we'll realize the maximum profit? You can see these likelihoods in Table 12.2. We can use the tools at www.OptionMath.com to calculate these likelihoods since, as we know, these likelihoods are the option deltas.

Today's likelihood of the 440 strike call being in-the-money at expiration, given all the variables including time to expiration, current stock price, volatility, and so on is 65 percent. We want this 440 call to be in-the-money at expiration so that we realize the maximum value of the 410/440 call spread. Today's likelihood of the 470 strike call being in-the-money is 33 percent; we want this 470 call to be out-of-the-money at expiration so that we keep the premium received for selling the 470/500 call spread. That means the likelihood of AAPL being between the two strike prices at expiration, AAPL being above 440 but not above 470, is 32 percent (65 percent – 33 percent). The likelihood of realizing the maximum profit of 11.13 for this call condor is that 32 percent.

What is the likelihood of realizing the maximum loss? That's the likelihood that AAPL is above 500 plus the likelihood that AAPL is below 410 at option expiration because either outcome will result in the maximum loss. The delta of the 410 call is 88, so today's likelihood of AAPL being below there at option expiration is 12 percent. The delta of the 500 strike call is 12, so the odds of AAPL being above there at option expiration are also 12 percent. That means the likelihood of this AAPL call condor realizing its maximum loss of 18.87 is 24 percent (12 percent + 12 percent). And what are the odds of at least breaking even? The downside

TABLE 12.2 Important Likelihoods for Our APPL Call Condor

Call Option Strike Price	Call Option Delta
410	88
428.84 (lower breakeven)	74
440	65
470	33
481.13 (upper breakeven)	25
500	12

breakeven is 428.87; this is the point at which the loss from the long call spread is precisely offset by the profit from the short call spread. We can calculate the delta for this hypothetical 428.87 strike call using the tools at www.OptionMath.com, but it means that we'll have to "borrow" the volatility input from a nearby option. If we do that we determine that the delta of this hypothetical call option is 74. The odds of losing the maximum amount because AAPL dropped below 410 are 12 percent, the odds of losing any money at all because AAPL dropped too far, that is, because AAPL dropped below 428.87, is 26 percent.

The odds of losing the maximum amount because AAPL rallied too far are 12 percent, the odds of losing any money at all because AAPL rallied too far are 75 percent.

It's enough to say that a long condor can be a good strategy if you're looking for a defined risk way to profit from low realized volatility over the term of the options, although the maximum loss can be substantially more than the maximum profit.

We've looked at buying a call condor in AAPL. Condors work well with puts as well. Since long put condors are very similar to long call condors, we'll take a very quick look at a long put condor. Figure 12.4 shows some puts on AAPL that we might use to construct a put condor.

Again, we're going to buy an in-the-money vertical spread and sell an out-of-the-money vertical spread. In this case, the in-the-money vertical spread we are buying is the 470/500 put spread (buying the 500 strike put, selling the 470 strike put) and the out-of-the-money vertical spread we're selling is the 410/440 put spread (selling the 440 strike put, buying the 410 strike put). The 470/500 put spread cost 24.35, while we receive 6.45 for selling the 410/440 put spread. The total cost of

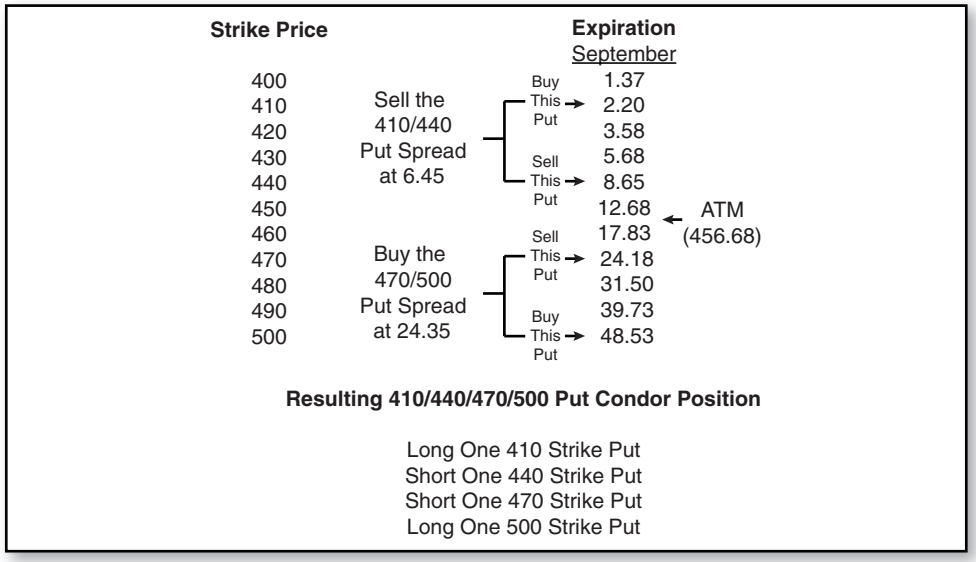


FIGURE 12.4 Buying a Put Condor in AAPL

TABLE 12.3 Our AAPL Put Condor and the Important Potential Outcomes

Outcome	Profit or Loss	Where Does It Occur?
Maximum profit	+12.10 (5.65 + 6.45)	Between 440.00 and 470.00
Maximum loss	–17.90 (24.35 – 6.45)	Below 410.00 or above 500.00
Breakeven (lower)	0 (5.65 – 5.65)	427.90
Breakeven (upper)	0 (6.45 – 6.45)	482.10

this put condor is 17.90. Notice that the vertical spreads have the same width, and they are about equidistant from where the stock is currently trading. And what is the maximum profit and loss for this Apple September 410/440/470/500 put condor? Where are those realized? We can see this in Table 12.3.

Let's connect the dots again and see the traditional payoff chart for this long put condor in AAPL. You can see this in Figure 12.5.

The general payoff for this put condor and the call condor that used the same strikes are very similar. Why aren't they identical? Because the underlying stock wasn't precisely between the two vertical spreads when we priced them. AAPL was at 456.68 so it was slightly closer to the 470/500 vertical. But the general shape of the two payoff charts is very similar, as we'd expect. So which condor to use? If the call condor is easier for you to understand, then use the call condor. If for some reason the bid/ask spread for in-the-money puts is tighter than for in-the-money calls, then use the put condor because it will be easier and cheaper to execute. We'll talk more about the bid/ask spread shortly.

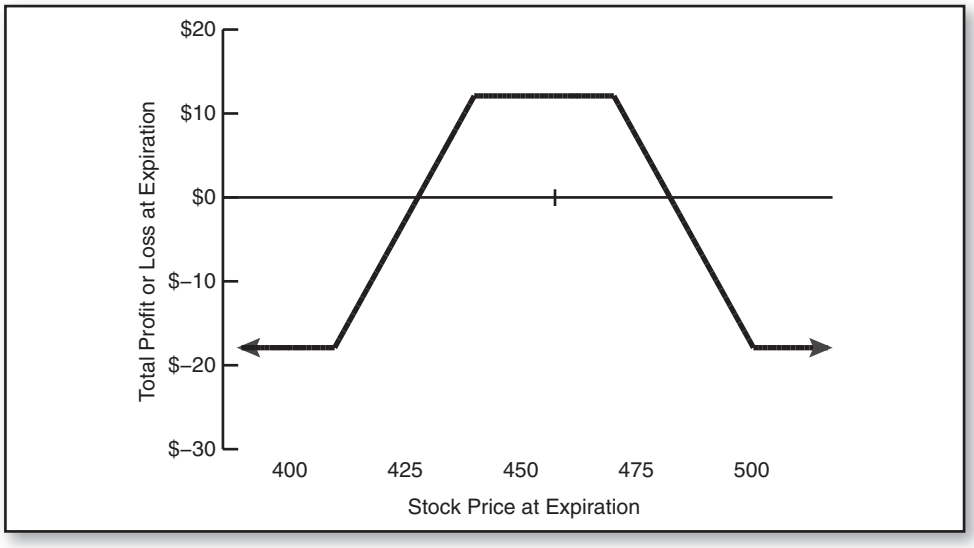


FIGURE 12.5 A Long Put Condor in AAPL

Selling a Condor

Since the maximum profit for a long condor is realized with the underlying stock between the two vertical spreads at expiration, we want the underlying stock to stand still, to not move, to not be volatile. This means that if we thought the underlying stock was going to do the opposite and be very volatile and make a big move we might want to sell a condor. For example, if we thought IWM, the Russell 2000 ETF, was going to be very volatile, then we might want to sell an IWM condor. Let's look at an IWM call condor that we might sell with IWM at 94.71. We see this in Figure 12.6.

We sell this IWM condor at 1.44 by selling the in-the-money vertical spread, the 91/94 call spread (selling the 91 strike call and buying the 94 strike call), at 2.13 while simultaneously buying the out-of-the-money vertical spread, the 97/100 call spread (buying the 97 strike call and selling the 100 strike call), at 0.69. Let's take a look at Figure 12.7 which shows the payoff for selling this IWM condor.

This short condor loses money, a maximum of 1.56, if IWM doesn't move. We collected a net of 1.44, but if IWM doesn't move, then the 97/100 call spread we paid 0.69 for will expire worthless, meaning we'll lose that 0.69 while the 91/94 call spread we sold at 2.13 will expire at its maximum value of 3.00, meaning we've lost 0.87. Our total loss will be 1.56 (0.69 + 0.87). It's no accident that our maximum potential loss is the width of one of the spreads minus the net premium collected.

IWM has to move below the 94 strike or above the 97 strike in order to not lose the maximum, it has to move below 92.44 or above 98.56 in order to make any money and it has to move below 91.00 or above 100.00 in order to realize the

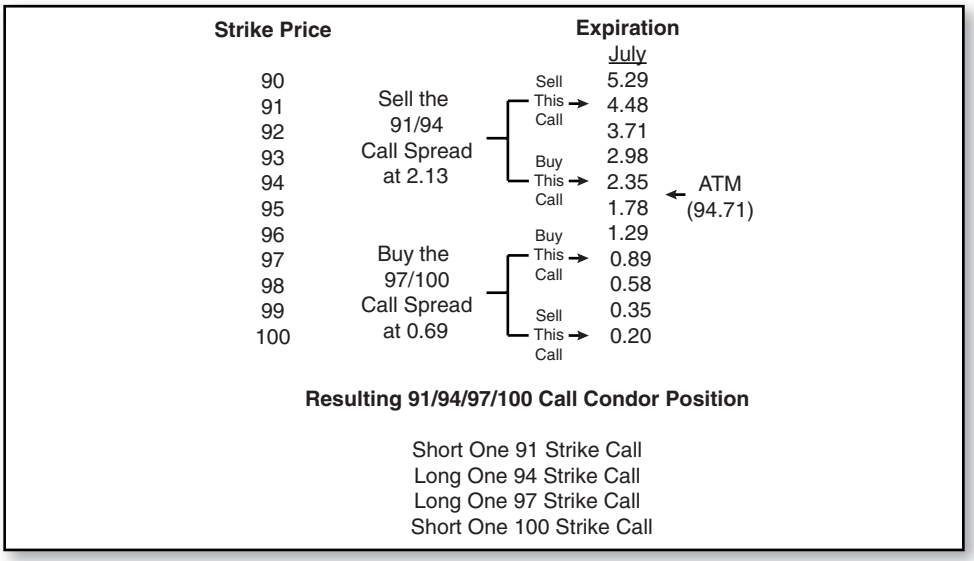


FIGURE 12.6 Sell an IWM Call Condor to Take Advantage of Expected Volatility

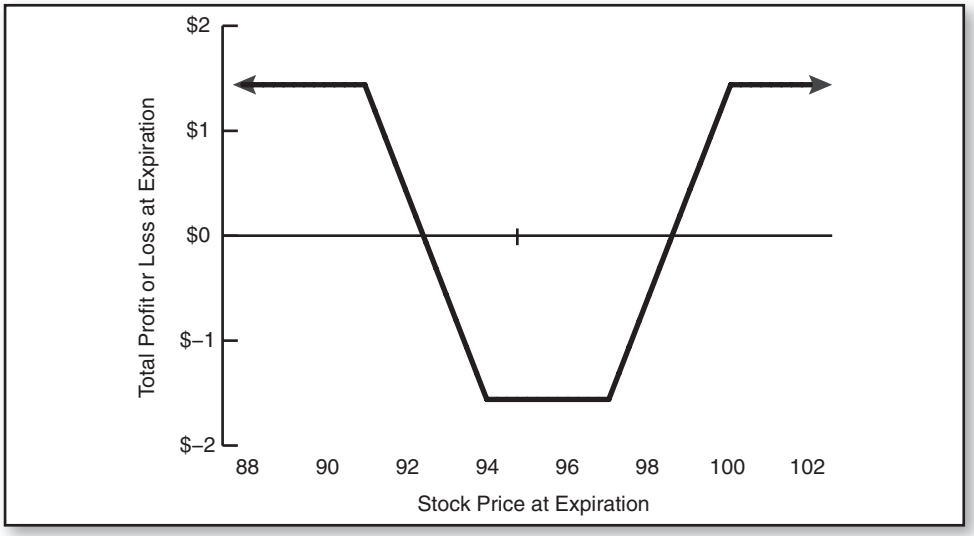


FIGURE 12.7 A Short Call Condor in IWM

maximum potential profit of 1.44. Let's see how big those moves are in percentage terms and what the delta says the likelihood of each move is. We see these in Table 12.4. Again, you can use the tools at www.OptionMath.com to calculate these deltas for yourself.

So the likelihood of losing the maximum amount is only 24 percent, but the likelihood of realizing the maximum profit is 38 percent.

Selling a condor is a little like buying a straddle. We expect substantial volatility in the price of the underlying but we don't know in which direction so we're going to cover all our bases and establish a position that makes money regardless of the direction of the move. It's cheaper to establish than a straddle, for example, the July 95 strike straddle would have cost 4.29, although 0.29 of that is inherent value. Our max loss from the straddle would be that 4.29 spent if IWM was at precisely 95.00 at option expiration. Both the short condor and long straddle need IWM to really move and both have limited risk but only the straddle has essentially unlimited profit. The

TABLE 12.4 **Important Likelihoods for Our Short Call Condor in IWM**

Describe Move	Price	Likelihood (Delta)
Move downward enough to avoid max loss	94.00	44%
Move upward enough to avoid max loss	97.00	32%
Move downward enough to reach breakeven	92.44	35%
Move upward enough to reach breakeven	98.56	19%
Move downward enough to achieve max profit	91.00	27%
Move upward enough to achieve max profit	100.00	11%

short condor, however, has its maximum potential profit fixed at 1.44 no matter how far IWM falls below 91.00 or rallies above 100.00. Selling a condor is like buying a straddle in that both are blunt instruments of trading because we don't have to be correct as to direction but the condor also has limited profit potential.

The Bid/Ask Spread and Condor Spreads

In buying a condor we said that we were essentially agnostic as to whether we establish our condor using puts or calls with one caveat. If calls or puts that are in-the-money show particularly tight bid/ask spreads then we generally want to use that type of option to establish our condor. It would be unusual for in-the-money puts to offer good (i.e., tight) bid/ask spreads and in-the-money calls to have wide bid/ask spreads but it's possible; usually, both will have bid/ask spreads that are tight or wide with tight being the exception if the option is in-the-money. But what general impact might the bid/ask spread have on our condor? After all, we're trying to execute four different options and we'll certainly try to execute our condor as a single trade minimizing the impact of the bid/ask spread but we'll still have to pay a liquidity provider something in the form of a bid/ask spread. Let's return to our very first condor and remember that the single price we saw for each option was, for simplicity's sake, the average of the bid and ask for each option. Table 12.5 shows the bid and ask for each component of that first condor that we bought, the AAPL 410/440/470/500 call condor, to see how the bid/ask spread might impact our condor.

If we were to simply pay the ask price for the options we need to buy and collect the bid price for the options we need to sell, we would pay 19.50 for this AAPL call condor rather than the 18.87 we assumed earlier. We'd pay 0.63 more, driving our maximum profit from 11.13 to 10.50 without any change in how or where that maximum profit is achieved. Given that we'd hope to execute our condor at those midpoints we originally used but that we'd have to give up something to get our trade done, after all, market makers aren't in business to facilitate our trade without making any profit for themselves, it's very likely that our actual execution price, the price we actually pay, is going to be higher than 18.87. Is there a way to reduce the impact of the bid/ask spread on the in-the-money call vertical spread? If we look at the four options making

TABLE 12.5 **Bid and Ask Prices for Our AAPL Call Condor**

Option	Bid	Ask
September 410 call	46.70	47.30
September 440 call	22.25	22.70
September 470 call	7.85	8.00
September 500 call	2.26	2.30

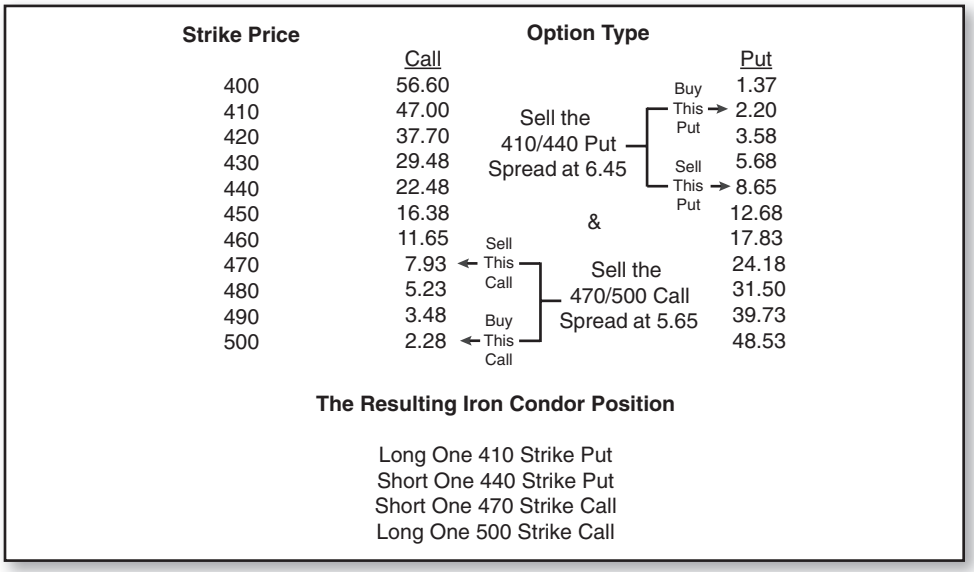


FIGURE 12.8 An Iron Condor in AAPL

up our call condor we'll notice that the out-of-the-money options, the 470 call and 500 call, have narrower bid/ask spreads than the in-the-money options, the 410 call and 440 call. Is there a way to replace that portion of our condor, the in-the-money 410/440 call spread, with something that's out-of-the-money and has bid/ask spreads similar to the bid/ask spreads of these other out-of-the-money options? What if instead of buying that 410/440 call spread we sold the 410/440 put spread meaning that we sold the 440 put and bought the 410 call? Figure 12.8 shows what that would look like.

The maximum profit for this trade would be the total of 12.10 received, 5.65 for selling the out-of-the-money call spread and 6.45 for selling the out-of-the-money put spread and would be realized if both vertical spreads expired worthless meaning AAPL was between 440 and 470 at option expiration, the same range of underlying prices that yielded the maximum profit for our original call condor. That maximum profit of 12.10 is not very different from the maximum profit of 11.13 for the first condor we looked at.

The maximum loss for this trade would be 17.90, the 30.00 maximum value of both spreads less the 12.10 received. We would experience that maximum loss if either of those vertical spreads was fully in-the-money at expiration. That means AAPL would have to be below 410 or above 500 at expiration for this trade to realize its maximum loss. It's interesting that this is the same range that would result in the maximum potential loss for our call condor. This maximum potential loss of 17.90 is not that much different than the maximum potential loss of 18.87 for our call condor spread.

And how would the bid/ask spread impact this new trade? Let's take a look at the bid/ask spreads for all of the options in this new trade.

TABLE 12.6 Bid and Ask Prices for Our New Option Structure in AAPL

Option	Bid	Ask
September 410 put	2.13	2.27
September 440 put	8.55	8.75
September 470 call	7.85	8.00
September 500 call	2.26	2.30

While we initially assumed we executed this trade at 12.10, even if we sold every option that we had to sell, the 440 put and 470 call, at the bid and simultaneously bought every option we have to buy, the 410 put and 500 call, at the ask, we'd execute our trade at 11.83 (6.28 + 5.55). That's only a 0.27 penalty charged by the width of the market rather than the 0.63 penalty we might have paid for our original condor. What is this new, magical structure called? It's an iron condor.

Iron Condor

An *iron condor* is executed by simultaneously selling an out-of-the-money put spread and an out-of-the-money call spread. Both spreads generally have the same width and they are roughly equidistant from the current stock price, although, as with all spreads and combinations, if changing a strike price results in a more logical trade or a trade that makes more sense given an important level on the stock chart, then don't feel bound by the traditional definitions. In this case, we execute an iron condor by selling the 410/440 put spread and simultaneously selling the 470/500 call spread. An iron condor is a limited risk, nondirectional trade that we'd execute when we expected little volatility. The goal is to have both vertical spreads expire worthless. What does this payoff chart look like? We see that in Figure 12.9.

The condor that resulted in the nearly identical payoff as this iron condor was a long condor so this iron condor is considered a "long" iron condor even though we're selling both spreads.

Observant readers will notice that our resulting option position is short one option strangle and long another wider option strangle that serves to define the risk. We sold the 440/470 strangle by simultaneously selling the 440 put at 8.65 and the 470 call at 7.93 to collect a total of 16.58. That 16.58 would be ours to keep, but we'd have unlimited risk so we simultaneously bought the 410/500 strangle by buying the 410 put at 2.20 and the 500 call at 2.28. That strangle cost 4.48 but again, it defines our risk. This "strangle spread" generates a net of 12.10 (16.58 – 4.48) in premium. That 12.10 is the maximum profit. The maximum potential loss is 17.90. The maximum potential profit and maximum potential loss are identical to the

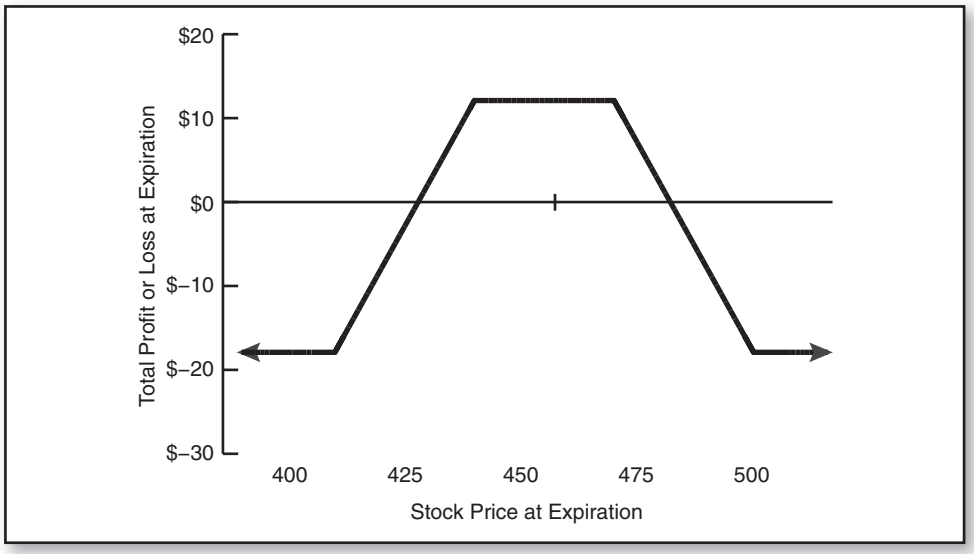


FIGURE 12.9 A 410/440/470/500 Iron Condor in AAPL

potential outcomes for our iron condor because the two trades are identical. Once you start to see these symmetries in your option positions, you'll understand the best way to make adjusting trades, and you'll be on your way to being a real option trader, not just an investor who uses options.

Directional Condors

So far, all the structures we've looked at have had an outlook as to volatility but not necessarily direction. We bought a condor if we thought the underlying wasn't going to be volatile and would be between the middle strike prices at expiration. Or, we sold a condor if we thought the underlying was going to be very volatile and get below the lowest strike price or above the highest strike price. We didn't care about direction as long as it went far enough in whichever direction it finally picked.

The same was true with iron condors. We either wanted the underlying to sit or move and if it moved, we didn't care in which direction.

What if we had a point of view on direction? We might buy a vertical spread. In doing so, we'll have gotten exposure in the desired direction while reducing the cost of simply buying an option outright. But we've already seen how we might replace an option with a vertical spread, what if we replaced both of the options in a vertical spread with vertical spreads. We'd have a directional condor and we'd probably have it pretty cheaply. Figure 12.10 shows some options in Netflix (NFLX) that we might use to create a directional condor if we were bullish NLFX.

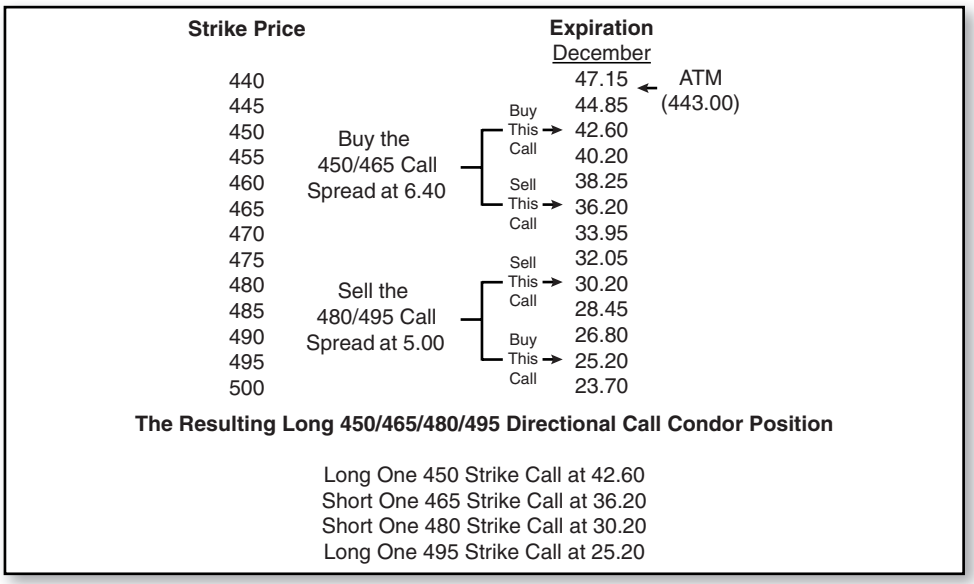


FIGURE 12.10 Buying a Directional Call Condor in NFLX

We pay a net of 6.40 for buying the 450/465 call spread, but we collect a net of 5.00 for selling the 480/495 call spread. Our net outlay is just 1.40, but if NFLX is above 465.00 and below 480.00 at the option expiration, our directional condor will be worth 15.00 (450.00 – 465.00). We will have turned our 1.40 into 15.00 for a profit of 13.60. You can see the payoff chart in Figure 12.11.

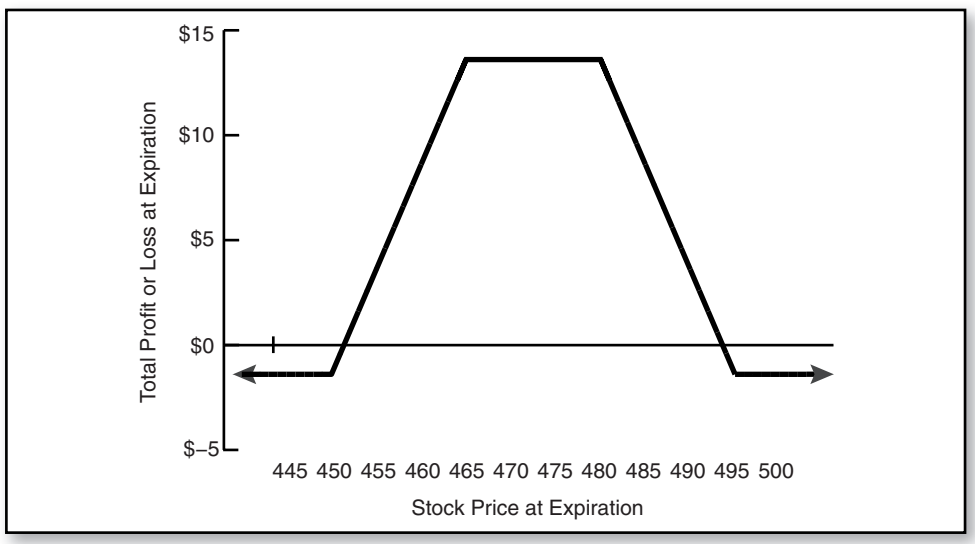


FIGURE 12.11 A Directional Call Condor in NFLX

TABLE 12.7 **Important Levels and Likelihoods for Our Directional Condor**

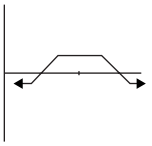
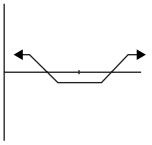
Describe Move	Price	Likelihood (Delta)
Move upward enough to avoid max loss	450.00	53%
Move upward enough to reach lower breakeven	451.40	52%
Move upward enough to realize max profit	465.00	48%
Move upward enough to begin surrendering max profit	480.00	43%
Move upward enough to reach upper breakeven	493.60	39%
Move upward enough to fully surrender value and realize max loss	495.00	38%

NFLX was at 443.00 when this condor was priced so all the options were out-of-the-money. Unless NFLX rallies to the lower strike price, 450 in this case, we'll lose the entire 1.40. If NFLX rallies too much and is above the 495 strike at expiration, we'll lose the entire 1.40 as well. But there's a pretty big sweet spot, 465.00 to 480.00, where we'll make the maximum profit and an even wider sweet spot, 451.40 to 493.60, where this condor will generate a profit even if the profit isn't the maximum potential profit. What are the likelihoods of these outcomes? We see that in Table 12.7.

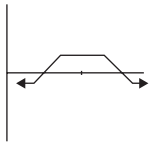
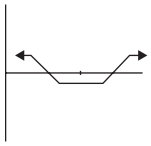
The likelihood of NFLX being between 465.00 and 480.00 at option expiration is just 5 percent (48 percent minus 43 percent) and the likelihood of generating any profit is just 13 percent (52 percent minus 39 percent), so the odds of turning our 1.40 to 15.00 are pretty remote. But that's what we'd expect. It's never going to be easy to generate a 1,000 percent profit.

A directional condor is just that, a directional trade. You wouldn't execute this call condor in NFLX unless you expected NFLX to rally gently until December expiration. And since all the legs are out-of-the-money, the bid/ask spread should be less of an issue than it would be for a traditional condor with one of the constituent spreads in-the-money, but you're still executing four different legs, so execution will be important to the ultimate profitability.

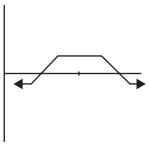
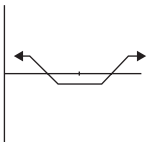
Call Condor Cheat Sheet

	Long Call Condor	Short Call Condor
Description	Long ITM call vertical spread Short OTM call vertical spread	Short ITM call vertical spread Long OTM call vertical spread
Example	Long One 90 strike call Short One 95 strike call Short One 105 strike call Long One 110 strike call	Short one 90 strike call Long one 95 strike call Long one 105 strike call Short one 110 strike call
Pay or Collect Premium	Pay	Collect
Needed Directionality		
Passage of Time without Market Movement	+ +	– –
Increase in Implied Volatility without Market Movement	+	–
Payoff Thumbnail Chart		
Maximum Risk	Net premium paid	Width of ITM spread – Premium received for selling ITM spread + Premium paid for OTM spread
Maximum Profit	Width of ITM spread – Cost of ITM spread + Premium received for OTM spread	Net premium received
Breakeven Points	Second lowest strike – Max profit Second highest strike + Max profit	Second lowest strike – Net premium received, second highest strike + Net premium received

Put Condor Cheat Sheet

	Long Put Condor	Short Put Condor
Description	Long ITM put vertical spread Short OTM put vertical spread	Short ITM call vertical spread Long OTM call vertical spread
Example	Long one 110 strike put Short one 105 strike put Short one 95 strike put Long one 90 strike put	Short one 110 strike put Long one 105 strike put Long one 95 strike put Short one 90 strike put
Pay or Collect Premium	Pay	Collect
Needed Directionality		
Passage of Time without Market Movement	+ +	– –
Increase in Implied Volatility without Market Movement	+	–
Payoff Thumbnail Chart		
Maximum Risk	Net premium paid	Width of ITM spread – Premium received for selling ITM spread + Premium paid for OTM spread
Maximum Profit	Width of ITM spread – Cost of ITM spread + Premium received for OTM spread	Net premium received
Breakeven Points	Second highest strike – Max profit Second lowest strike + Max profit	Second highest strike – Net premium received, second lowest strike plus net premium received

Iron Condor Cheat Sheet

	Long Iron Condor	Short Iron Condor
Description	Long OTM call vertical spread Long OTM put vertical spread	Short OTM call vertical spread Short OTM put vertical spread
Example	Long one 105 strike call Short one 110 strike call Long one 95 strike put Short one 90 strike put	Short one 105 strike call Long one 110 strike call Short one 95 strike put Long one 90 strike put
Pay or Collect Premium	Pay	Collect
Needed Directionality		
Passage of Time without Market Movement	– –	+ +
Increase in Implied Volatility without Market Movement	+	–
Payoff Thumbnail Chart		
Maximum Risk	Net premium paid	Width of one spread minus net premium received
Maximum Profit	Width of one spread minus net premium paid	Net premium received
Breakeven Points	Lower call strike plus net premium paid, higher put strike plus net premium paid	Lower call strike plus net premium received, higher put strike plus net premium received

CHAPTER 13

Conversion/Reversal

A conversion or a reversal is an option combination that retail traders will execute very rarely as a package (meaning as a single trade) and professional market makers will execute only occasionally. But a conversion or reversal is an option combination that a smart retail trader might end up having on; however, it will only be because of separate trades that lead to the ultimate conversion or reversal position.

A conversion is a three-legged combination made up of a long position in the underlying stock and a synthetic short position in the stock made up of a long put and short call, both with the same strike price and expiration date.

A conversion:

Long 100 shares of KO at 39.70
Short 1 November 39 call at 0.95
Long 1 November 39 put at 0.25

How does this conversion make money? We start with 0.70 in our pocket because we sold the 39 call at 0.95 but paid only 0.25 for the 39 put. The combination of the two option positions is a synthetic short position in KO stock. How so? Short a call and long a put with the same strike and expiration date will end up selling the stock—either the call will be assigned and we'll sell the stock at the exercise price of 39.00, or we'll exercise the put and sell the stock at the exercise price of the put; again that's 39.00. For example, if KO is at 35.00 at expiration, below the strike price of our put, then the call would expire worthless and we would exercise our put, thereby selling our KO shares at 39.00. But we paid 39.70 for the stock, so the net of 0.70 we collected from our options pays for the loss on our stock. Ignoring commissions, we've broken even on our conversion, so it didn't make any money with KO below the strike at expiration.

If KO is at 40.00 at expiration, above the strike price of our options, then we'd still start with that 0.70 in our pocket from the synthetic short position. The long put would expire worthless but our short call would be in-the-money and the owner would exercise it. That means we would be forced to sell our stock at 39.00, the strike price of the call we're short, even though KO was at 40.00. We'd be selling stock at 39.00 that we had just bought at 39.70, so we would experience a 0.70 loss on the stock. This would be precisely offset by the net of 0.70 we collected from selling the call and buying the put. Again, ignoring commissions, we've broken even on our conversion so it didn't make any money with KO above the strike at expiration.

The conversion didn't make money with the stock below the strike price and didn't make money with the stock above the strike price. What happens with the stock right at the strike price?

If KO is at precisely 39.00 at expiration, then both options will expire worthless; who would pay for an option to buy or sell KO at 39.00 if you could just buy or sell at 39.00 directly? We started with 0.70 in our pocket and that will precisely offset the 0.70 loss we experienced as KO dropped from 39.70 to 39.00. In this case, we still own the stock, but we could easily sell it at 39.00 and be done with the trade for no profit or loss. In fact, if we don't sell it we're making a conscious decision to keep it. This situation, when the stock is precisely at the strike price at expiration, causes special concerns for the option user. Why? If the owner of the call is also short the stock then he may choose to exercise his call thereby closing his short position in the stock. If that is the case, we own KO stock and have it called away then we can let our long put expire worthless and we'll deliver our shares to the call owner and we'll be left with no profit or loss and no position. If the owner of the call doesn't exercise his option, then it will expire worthless and we might chose to exercise our put, thereby selling our shares. Again, we'd be left with no profit or loss and no position. If we want out of the position completely, including selling our stock, then we either want our short call assigned or we want to exercise the put we own, *but not both*.

The problem for this position is that we won't know if the call owner has exercised his call until it's too late to choose to exercise our put. We would have to guess whether the owner of the call is going to exercise before making a decision about what to do with our put—exercise it or abandon it.

This is the situation when a trader might execute one of these three-legged trades—in order to take the whole trade off and eliminate this risk of the stock closing precisely at the strike price on expiration.

Because the long stock is precisely offset by the synthetic short position in the stock that is created by selling a call and buying a put with the same strike price and expiration, a conversion should never make or lose money ignoring commissions and the bid/ask spread.

All this doesn't mean you might not leg into the position over time at prices that are ultimately profitable. We'll discuss how this can happen later in this chapter. It simply means that you shouldn't be able to execute such a three-legged trade as a package, as a single trade, and do so at prices that would generate a profit at expiration.

Reversal

A reversal is the opposite of a conversion. A reversal is a three-legged combination made up of a short position in the underlying stock and a synthetic long position in the stock made up of a long call and short put, both with the same strike price and expiration date.

A reversal:

Short 100 shares of KO at 39.70
Long 1 November 39 call at 0.95
Short 1 November 39 put at 0.25

Let's do the same exercises and see if a reversal can make money. With KO at 36.00 at expiration, the owner of the put we're short would exercise it and we would buy KO at 39.00, the strike price. The call we're long would expire worthless. We would have made 0.70 on the stock (shorted at 39.70, bought at 39.00), which would offset the net of 0.70 that we paid to buy the call and short the put. Ignoring the bid/ask spread and trading costs we didn't make or lose any money. If we were to do the same sort of math for a closing price above the 39.00 strike price we'd find the same outcome. If we were to do the same math for a closing price of precisely 39.00, we'd find the same outcome. Conversions don't make money and reversals don't make money. In fact, after accounting for the bid/ask spread and trading costs, both a conversion and reversal will likely lose money. So you'd never initiate either combination; how might you end up with a conversion or reversal as a position?

Let's assume I'm long 100 shares of XYZ stock. The stock has appreciated nicely, and I think it's likely to move sideways to down slightly over the next several months. If I could sell it at a slightly higher level than the current price, then I'd like to do that. If I could get a little downside protection, then I'd like to do that, too, but I'm not hugely worried, and I'm happy to hold my stock otherwise. This is the perfect time to do a covered call; if the stock rallies, then it will be called away and we will have sold it at a slightly higher price than I could get right now. The premium we collect from selling the covered call will generate a little bit of downside protection. Perfect! If we sell a covered call, we end up with this position:

A covered call:

Long 100 shares of XYZ which is now at 56.35
Short 1 April 57 call at 1.25

Let's assume that after we've sold the covered call XYZ stock rallies slightly, which is what we thought might happen. If XYZ is at 57.75 with a couple of weeks to April expiration, then our covered call has worked perfectly. Assuming XYZ doesn't drop back below that 57 strike price then we're going to sell our stock at 57.00, but we'll also have the 1.25 in premium. We'll sell our stock at an effective price of 58.25 even though it was at 56.35 when we sold the covered call, is at 57.75 now, and despite the fact that XYZ may never trade as high as 58.25. But this all assumes XYZ doesn't drop back below the 57 strike price. If that happens then the owner of the call we're short won't exercise it and we'll still own the stock, something we didn't want. In fact, if XYZ drops below 55.10 then we're worse off for having sold the covered call rather than just selling our stock at 56.35. In this case, that's not what we wanted; we wanted to sell if we could do so above the current market. So how can we be certain we'll get to sell our stock at a price no lower than 57.00 after it's risen to 57.75, rather than being at the mercy of the owner of the call we're short and at the mercy of the market? By buying a 57 strike put! Time has passed and XYZ stock is higher, so that put should be fairly inexpensive. If we could buy it today at 0.10 then we would still have 1.15 (1.25 – 0.10) in our pocket and we'd be almost certain of selling our stock at 57.00. The only time we wouldn't be certain is if XYZ closed right at 57.00 on the day these options expire. Why not just sell the stock and buy the call back? Because the bid/ask spread for the in-the-money call option is likely to be pretty wide, while the bid/ask spread for the out-of-the-money put will probably be only 0.01 and the time value for the put, 0.10, will be identical to the time value of the call so we're better off paying the same amount of time value but paying a smaller bid/ask spread by buying the put. What would this new position look like?

Our new position:

Long 100 shares of XYZ
Short 1 April 57 call at 1.25
Long 1 April 57 put at 0.10

Our new position is a conversion. You can see that it's identical to the definition of conversion we started with. We're long stock and have a short synthetic position in the stock thanks to the short call and long put of the same expiration date and strike. This is how a trader ends up with a conversation even though he might never initiate the trade as a conversion. We'd say he legged into it. If XYZ drifted back down and was at 57.00 at April expiration, then we might decide to close out the entire position, selling the stock we're long, buying the call we're short, and selling the put

we're long in order to eliminate the risk of not knowing what the owner of the call will do. This risk is pin risk, that is, the risk of the stock closing right at that 57.00 strike. We'll talk more about pin risk later in this chapter.

Dividends

So we've seen how we can't make any money by initiating a conversion or a reversal but that we might end up having the position on. Let's take another look at KO options and make certain we can't make any money by initiating a conversion or reversal. The first KO options we examined expired in November; these options expire in December.

A reversal:

Short 100 shares of KO at 39.70
Long 1 December 39 call at 1.16
Short 1 November 39 put at 0.65

Let's make certain this trade can't be profitable. We spend a net of 0.51 for the synthetic long stock that we execute by selling the put and buying the call. With KO at 35.00 at December expiration, our call will expire worthless, but the owner of the put we're short will exercise it and we'll buy KO at 39.00, the strike price. We'll make 0.70 on the stock we were short. That means we will have made a net of 0.19 (0.70 – 0.51)! What if KO is above that strike price? With KO at 41.00 at expiration, we will have still spent 0.51 for the options that create the synthetic long stock position. The put will expire worthless and we'll exercise our call and buy KO at 39.00. We were short at 39.70, so we make a net of 0.19 again! And if KO is at 39.00 at expiration? Well, we face the same pin risk that we discussed earlier but the odds of that are small and we'll still make 0.19. How can this be? Why wouldn't I do this trade as many times as my broker will let me and pocket 0.19 for each contract? Because there is a dividend that will be paid after the November options expire and before the December options expire. If you've shorted stock, that means you borrowed it first and you'll have to pay the amount of the dividend to whoever lent you the stock. That's the discrepancy. There's no "free money" to be made.

Pin Risk

We've mentioned pin risk, it's the risk that the stock closes right at, or very close to, the strike price shared by both the put and call, on the day of expiration. In that case we don't know if the owner of the short leg of our conversion or reversal will exercise it—it may have simply been a speculation for them so they may not have

any reason to exercise it, or it may be a hedge in order to liquidate their position such as a long call versus short stock; in that case, the owner of the call may very well exercise it—and we won't know if they have exercised it until it's too late for us respond. That's one of the benefits of owning options and one of the liabilities of shorting options.

Rather than taking the entire trade off to avoid pin risk, is there an easier way to avoid pin risk while potentially spending less on commissions and the bid/ask spread? Sure, we can just buy back the option we're short. With a few hours of trading left on the day of option expiration we have the following conversion on:

Long 100 shares of ABC at 90.00
Short 1 90 call trading at 0.10
Long 1 90 put trading at 0.10

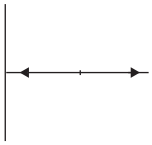
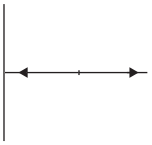
Rather than taking this entire trade to expiration and hoping that we can figure out what the owner of the call we're short will do, we can just buy that call back, pay 0.10 and have the destiny of the trade in our own hands. After we do that, we're left with this:

Long 100 shares of ABC at 90.00
Long 1 90 put trading at 0.10

With the new position, we're going to get nothing less than 90.00 for our stock because even if it's below 90.00 at the end of the day, we'll exercise our put. If ABC is above 90.00 at the end of the day, we can sell our stock for whatever we can get and let the long put expire worthless. And if ABC is at precisely 90.00 at the end of the day, we can go ahead and exercise our put and sell the stock there. This is one of those situations when someone might exercise an option that is precisely at-the-money.

We've avoided all the perils of pin risk, and it only cost us the 0.10 we paid to buy back our call. If you're certain you want to completely exit the position, including the position in the underlying ABC stock, then once you've bought your short call back you can offer the stock for sale at 90.10 using a limit order. If your offer is lifted and you sell the stock at that price then you've made back the 0.10 spent to close the short call position. We've exited our position just as we wanted, we don't have the uncertainty of pin risk, and we're simply left long the 90 strike put. Since there's so little time until expiration, probably just a couple of hours, and since ABC is trading higher, at 90.10, we probably can't sell this put at any price. But once we've sold our stock, we can offer this put for sale at, say, 0.10, again using a limit order. If ABC drops again before expiration then we might end up selling our put and we will have actually made 0.10 more than if we'd simply taken the entire position to expiration with the attendant pin risk.

Conversion and Reversal Cheat Sheet

	Conversion	Reversal
Description	Long shares Short shares synthetically	Short shares Long shares synthetically
Example	Long 100 shares Short one 100 strike call Long one 100 strike put	Short 100 shares Long one 100 strike call Short one 100 strike put
Pay or Collect Premium	Pay if strike price is above share price, collect if strike price is below share price	Pay if strike price is below share price, collect if strike price is above share price
Needed Directionality	Does not matter, no movement will generate a profit or loss	Does not matter, no movement will generate a profit or loss
Passage of Time without Market Movement	No impact	No impact
Increase in Implied Volatility without Market Movement	No impact	No impact
Payoff Thumbnail Chart		
Maximum Risk	Pin risk is the only risk inherent in a conversion	Pin risk is the only risk inherent in a reversal
Maximum Profit	Should be zero	Should be zero
Breakeven Points	A conversion should break even at every price for underlying at expiration	A reversal should break even at every price for underlying at expiration

CHAPTER 14

Ratio Spreads and Back Spreads

Nearly all the spreads and combinations we've examined so far offer one element, an option or a vertical spread, versus or in combination with only one other element, an option or a vertical spread or shares of stock or cash to buy the shares if they're put to us. Finally, in ratio spreads and back spreads, we look at one option at a strike price versus more than one option at a strike price that is farther from at-the-money.

Ratio spreads buy one option and sell two options of the same type and expiration with a strike price that is farther from at-the-money. The result is a trade that makes money if there's a modest move in a particular direction, upward if we're using a call ratio spread, and downward if we're using a put ratio spread, but since we're net short an option—we sold two options but bought only one—the trade losses money if the move is too extreme. Since we're net short an option, the loss can be substantial.

Back spreads, however, sell one option and buy two options of the same type and expiration with a strike price that is farther from at-the-money. A back spread is a trade that requires a substantial move, upward for a call back spread and downward for a put back spread. If the underlying moves only a little, even though it moves in our desired direction, then a back spread can lose money, but a substantial move in the expected direction will generate unlimited returns for a call back spread and returns that are limited only by the fact that the underlying stock can't drop below zero for a put back spread. Figure 14.1 shows some put options in QQQ, the Nasdaq 100 exchange-traded fund (ETF), and a put ratio spread that we might construct in the April expiration as well as a put back spread that we might construct in the May expiration.

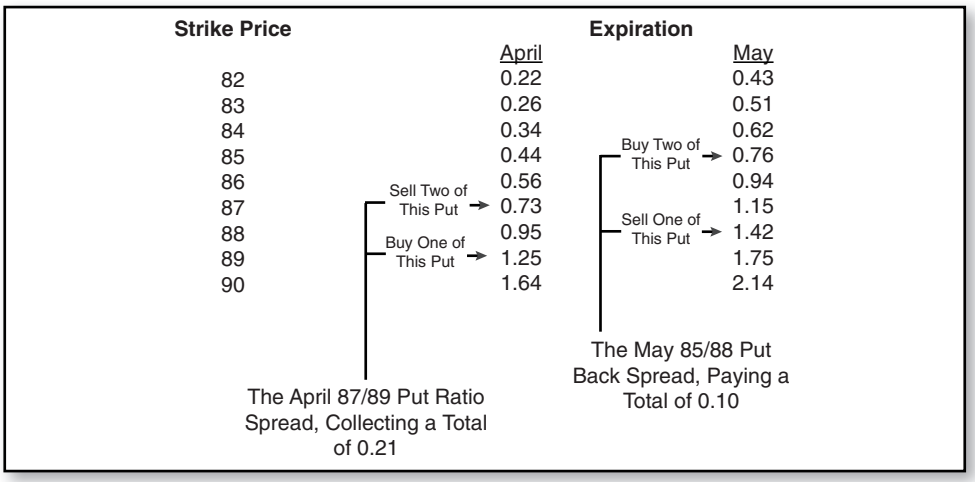


FIGURE 14.1 An April Put Ratio Spread and a May Put Back Spread in QQQ

Ratio spread and back spread strike prices are generally selected so that the trade is done for zero or very little net premium, but that's where the similarities end. We'll look at the two strategies separately.

The put ratio spread that we construct using the options in Figure 14.1 buys one of the April 89 strike puts at 1.25 and sells two of the April 87 strike puts at 0.73 each, collecting a total of 1.46 for selling the two puts. The ratio spread generates 0.21 in net premium that we get to keep. Let's look at Figure 14.2 to see the payoff for this put ratio spread.

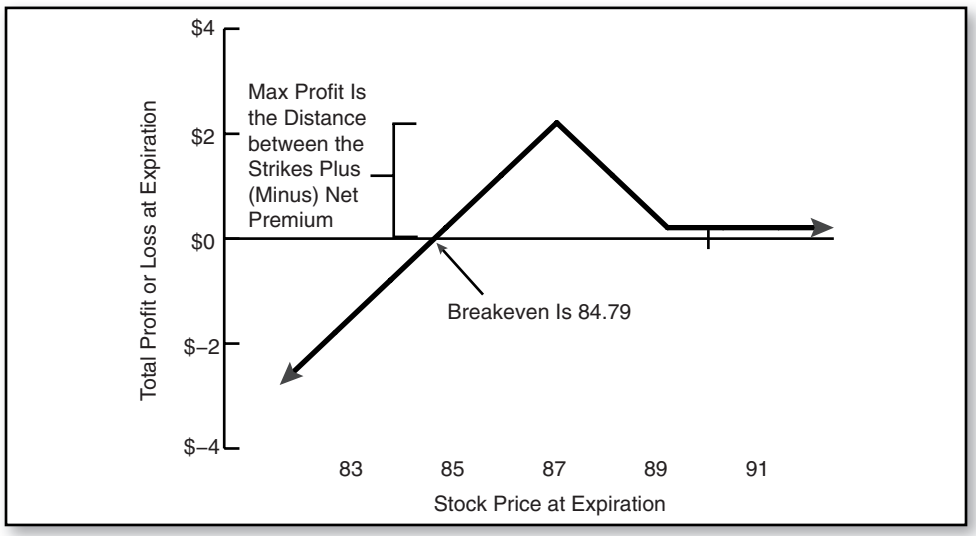


FIGURE 14.2 The April 87/89 Put Ratio Spread in QQQ

As QQQ falls below the strike price we're long, the 89 strike, this put ratio spread starts to make money in addition to the 0.21 net that we collected at initiation. The maximum profit is achieved when the underlying is precisely at the strike price of the options we're short, 87.00 in this case. At that point, the 89 strike put is worth 2.00 at expiration, the 87 strike puts we're short are worthless at expiration, and we have that additional 0.21 in our pocket. As we've seen before, the maximum profit is realized with the underlying stock at the strike price of the options we're short at expiration.

As QQQ falls below the 87.00 level, those 87 puts start to have value at expiration; they're no longer worthless at expiration. They start to eat into the 0.73 we received for selling each of them. And since we're short two of them and long only one of the 89 strike puts, our losses increase as QQQ drops. And the breakeven for our put ratio spread? We have to account for the long put making money and the short puts losing money. The breakeven for a put ratio spread is the lower strike, 87 in our case, minus the width of the spread, 2.00 in our case, less any net premium received or plus any net premium paid since this is a put ratio spread. We subtract if we received premium because that moves the breakeven lower, farther from at-the-money, and we add if we paid premium because that moves the breakeven up, closer to at-the-money. In our put ratio spread, we collected 0.21 of premium, so our breakeven point is 84.79 (87.00 – 2.00 – 0.21).

The general shape that we see in Figure 14.2 will hold for all put ratio spreads, although if we'd paid a small amount of net premium, the payoff chart would look slightly different and the payoff for prices higher than the upper strike price would be a net loss of the net premium we paid. For example, if we had instead executed the 86/89 put ratio spread by buying one of the 89 strike puts at 1.25 and selling two of the 86 strike puts at 0.56 each we would pay a net of 0.13. With QQQ above 89.00 at expiration our put ratio spread is going to lose that 0.13. That's not the only way our payoff chart would look slightly different. We see that in Figure 14.3.

Below that breakeven (the lower breakeven for put ratio spreads done at a debit) the trade that was mildly bearish has gone too far—it's dropped too much. Ratios spreads are like a butterfly in that the underlying stock can move too much. Observant readers will notice that a ratio spread is very similar to a butterfly except that a butterfly is also long one even farther out-of-the-money option in order to define risk. If we started with our original put ratio spread, the 87/89 put ratio spread, and bought an 85 strike put at 0.44 we would have turned our 87/89 put ratio spread into an 85/87/89 put butterfly. We can see this in Figure 14.4.

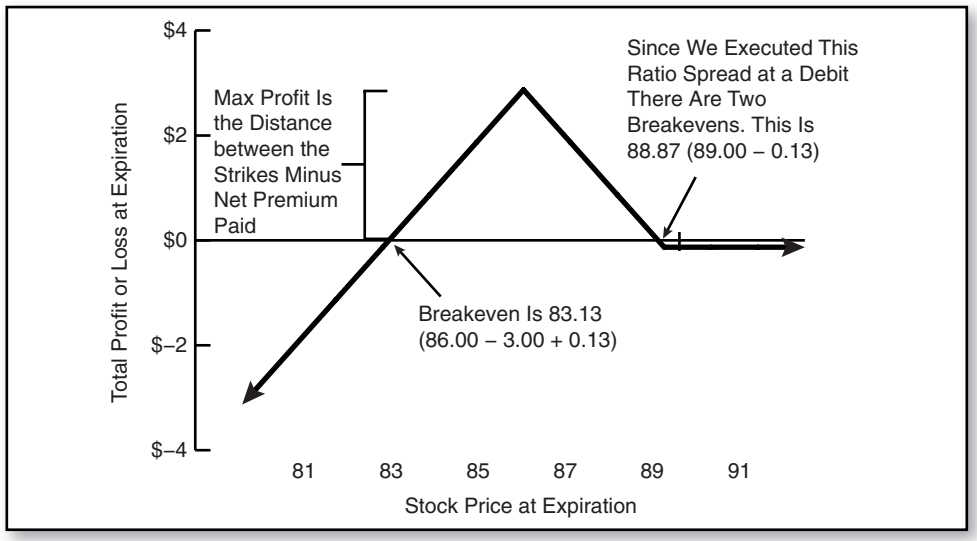


FIGURE 14.3 The April 86/89 Put Ratio Spread in QQQ Done at a Net Debit

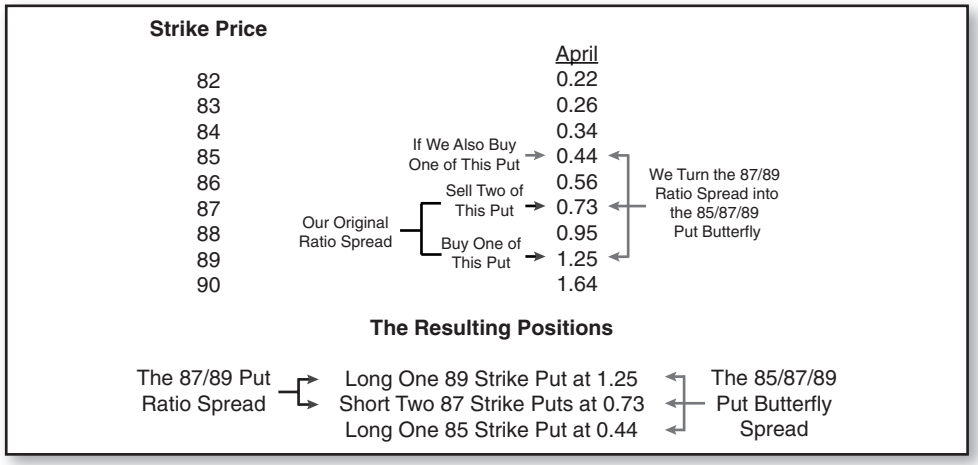


FIGURE 14.4 A Ratio Spread Is Almost a Butterfly

Vertical Spreads, Butterflies, and Ratio Spreads

By now you recognize that vertical spreads, butterflies, and ratio spreads are similar even though they're not identical. A butterfly is a spread of two vertical spreads and a ratio spread is both a butterfly without the most out-of-the-money wing and a long vertical spread that is paid for by selling an extra out-of-the-money option (what would be the body of the butterfly). As we go from vertical spread

to butterfly spread to ratio spread, the cost of the trade goes down until we're at the ratio spread, which will be done for nearly zero net premium or that might actually generate a little net premium for us to collect as we saw in the first put ratio spread, the 87/89 put ratio spread that we examined. But while the cost has dropped as we move from vertical spread to butterfly spread to ratio spread, the danger from the underlying moving too far has increased. For a long vertical spread, the underlying can't move too far. As long as the underlying stock has moved beyond our long vertical spread, that is above both strike prices for a call vertical or below both strike prices for a put vertical, then we will make the maximum profit possible at expiration, and it doesn't matter how far it moves beyond our vertical spread. At expiration, $100 past our long vertical spread is as good as $0.10 past our spread. For a long butterfly spread the underlying can move too far and the profit we had when the underlying was at the strike of the options making up the body of our butterfly becomes a loss with that additional movement, but our loss is limited to what we paid for the butterfly no matter how far the underlying stock moves past our butterfly. For a ratio spread, not only can the underlying move too far but the profit we would enjoy with the underlying at the short strike at expiration becomes a loss and that loss is essentially unlimited. As the cost of the trade structure drops, the risk increases. You can see this in Figure 14.5. Note that the risk increases as the cost of the spread decreases but note also that the maximum profit is always realized or first reached at the strike of the option we're short, 87.00 for these spreads.

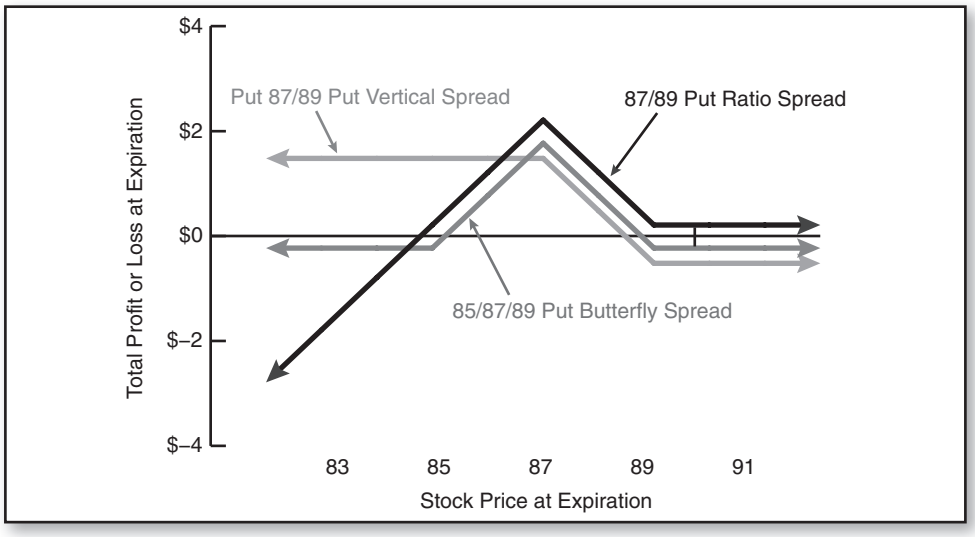


FIGURE 14.5 Put Ratio Spread, Put Butterfly, and Put Vertical Spread

Call Ratio Spreads

Call ratio spreads need the underlying stock to rally slightly, and like put ratio spreads, they sustain substantial losses if the underlying stock moves too much, even if the move is in the desired direction. Let's look at some options on DIA, the Dow Jones Industrial Average exchange traded fund, and see how we might construct a call ratio spread and a call back spread. You can see these in Figure 14.6.

This call ratio spread is constructed the same way we constructed the put ratio spread. We buy one call option and sell two call options that are farther out-of-the-money to pay for the call option we buy. The May 167/169 call ratio spread is done for nearly zero net premium as we collect only 0.01 for executing it. Since we're short two calls and long only one call, this ratio spread would have unlimited risk if DIA rallied enough. The maximum profit of 2.01 is realized with DIA at the short strike price, 169.00 here, at expiration. You can see the payoff at expiration across a range of prices in Figure 14.7.

Since any ratio spread is short more options than it is long, there will be a tendency to want to close the position prior to expiration, thereby extinguishing that risk. We've seen previously that our spreads and combinations don't realize their full profit until expiration. Let's see how the value of our DIA 167/169 ratio spread changes as time passes, assuming DIA didn't move. You can see this in Figure 14.8.

As we've seen before, the payoff at expiration is linear and the payoffs become more linear as expiration nears. But with 30 days to expiration, there is no price above at-the-money that generates a profit. Why is that?

With substantial time to expiration, the 169 calls we're short will appreciate in price too quickly for the 167 call we're long. The loss on the two 169 calls will overwhelm any profit on the single 167 call. With 51 days to expiration, the day we observed these prices, the delta of the 167 call was 27, while the delta of the

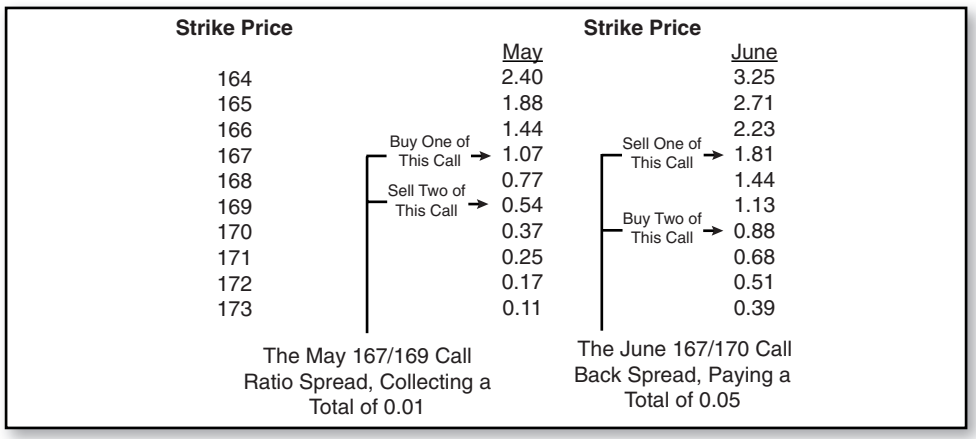


FIGURE 14.6 A May Call Ratio Spread and a June Call Back Spread in DIA

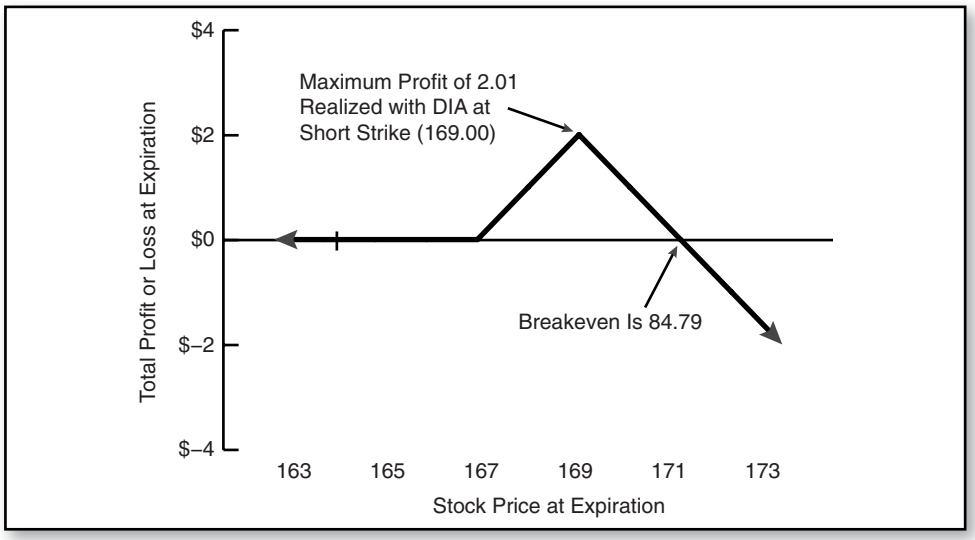


FIGURE 14.7 The 167/169 Call Ratio Spread in DIA

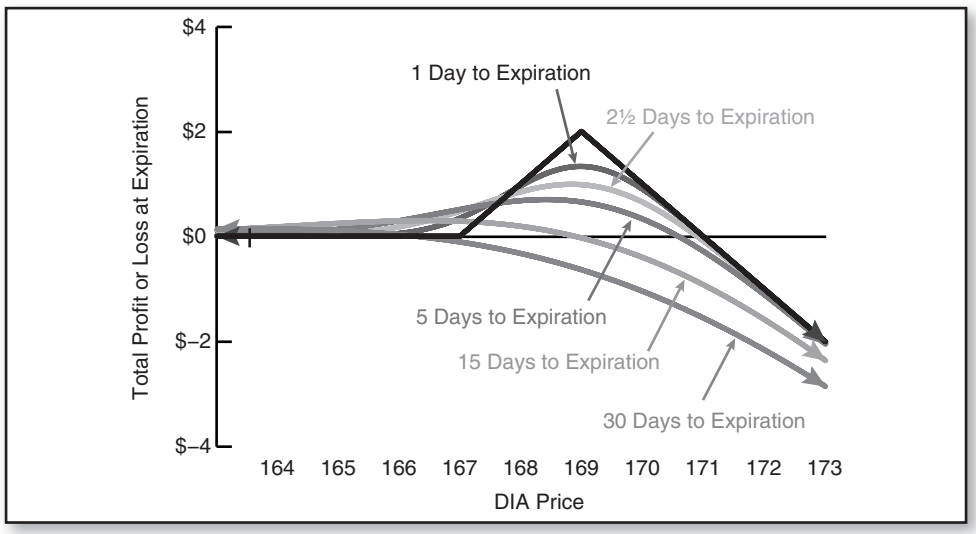


FIGURE 14.8 How the DIA 167/169 Call Ratio Spread Changes as Time Passes

169 call was 17. That means that with 51 days to expiration, a rally of 1.00 in DIA would increase the price of the 167 call by 0.27, and we'd make 0.27 since we're long one of those. But the price of the 169 strike call would increase by 0.17, and since we're short two of those our loss would be 0.34 resulting in a net loss of 0.07. And this problem only gets worse as DIA rallies. At 166.00 with 51 days to expiration, the delta of the 167 call is 43, while the delta of the 169 call is 31. And the problem doesn't really get better with the passage of just a little time. Why?

Because with 30 days to expiration, the delta of our 167 strike call, assuming DIA hasn't moved from 163.16, is 22. And the delta of our 169 strike call is 11. That means that with 30 days to expiration, the 167 strike call we're long will go up in value by 0.22 if DIA moves from 163.16 to 164.16, while the 169 calls we're short will go up in value by 0.11. But we're short two of the 169 calls so the 0.22 we make from our long 167 call is almost exactly offset by the loss in our 169 calls. And this only gets worse as DIA rallies because those deltas will change over time—they'll both increase as DIA rallies. Those deltas were 22 and 11, respectively, with DIA at 163.16 and 30 days to expiration. At 166.00 and 30 days to expiration, those deltas are 42 and 26. The tools at www.OptionMath.com are available so you can experiment with any ratio spread you're considering.

Until the options are very cheap a ratio spread is a short volatility position, we need relatively little movement, and we need it in the right direction—upward for a call ratio spread, and downward for a put ratio spread. But a ratio spread isn't really a directional position in that we won't make money just because the underlying has moved in the right direction; we need the underlying stock to be very near the short strike at expiration. If it hasn't moved enough, we won't make much money, and we'll lose money if we put the ratio spread on for a debit. If it's moved too much, we'll lose money as well. Like a butterfly, a ratio spread has a "sweet spot," and we need the underlying stock to be there at expiration.

Call Ratio Spreads for Stock Repair

A call ratio spread is short more call options than it is long. We could cover that extra short call if we owned the underlying stock, as we discussed in Chapter 4. The potential exists to have our stock called away, but it would be at an effective price that's much higher than the current stock price and potentially higher than a simple covered call. It's possible to use a call ratio spread to sell stock at a price much higher than the stock is at now; in fact, it's possible to sell the stock at an effective price that is higher than the stock ever actually trades at. And since we execute our call ratio spread for no net premium, we're no worse off if our stock isn't called away than if we'd done nothing. If we're facing an unrealized loss on our stock and would be happy to close the position and sell our stock if we could sell at an effective price greater than the current stock price, then we can use a call ratio spread; call ratio spreads are a great tool for stock repair. Let's look at the price of Amazon (AMZN) because it's widely held, but it's also well off its recent high. Figure 14.9 shows the 52-week chart for AMZN.

Let's assume we're long AMZN from 390.00 and it's currently trading at 344.00. We need some stock rehab. Let's look at some call options in AMZN that we might use for that stock rehab. You can see those options and the call ratio spread we might execute in Figure 14.10.

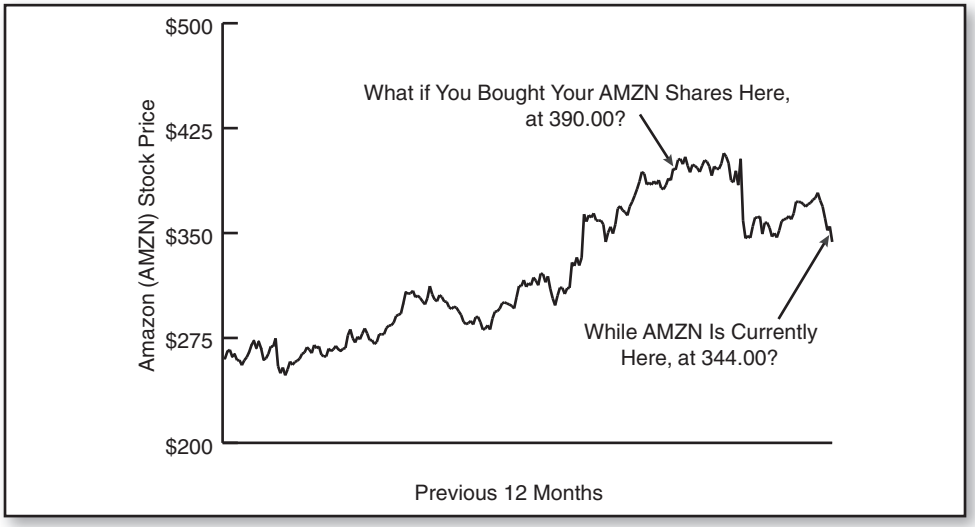


FIGURE 14.9 Stock Chart of Amazon (AMZN) for a Call Ratio Spread

You'll notice that for the resulting position in Figure 14.10 we treat our AMZN stock as if we were long it from the current price of 344.00, rather than the 390.00 we originally paid. That's because in many ways we *are* long at the current price. The market neither knows nor cares where we bought the stock, and in making the decision to not sell at the current price, 344.00, we're effectively making the decision to own it, that is, to buy it, there.

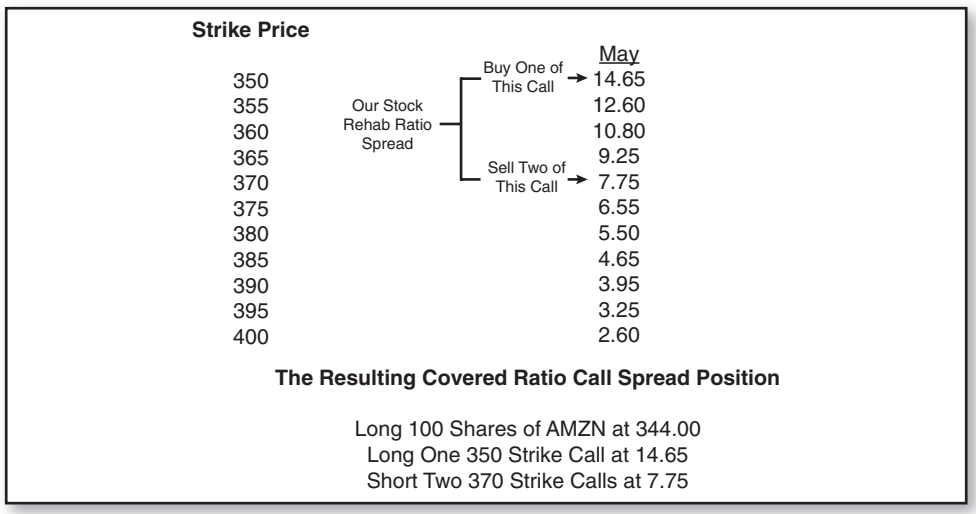


FIGURE 14.10 AMZN Call Options for Stock Rehab

While we're buying one of the at-the-money calls, and that might seem as if we're adding to a losing trade which is a no-no, our goal is to have AMZN above 370.00 at May expiration. It's easier to see how this works as stock rehab if we break the trade down differently. Instead of thinking of it as a ratio spread, think of it as buying the 350/370 call vertical spread at 6.90 (buying the 350 strike call at 14.65 and selling the 370 strike call at 7.75) and paying for that vertical call spread by selling a 370 strike covered call (covered by ownership of the underlying stock) at 7.75. Our ratio spread generates 0.85 in net premium that we get to keep no matter what, and while that 0.85 doesn't make up for much of our unrealized loss in AMZN stock, it means that if AMZN continues lower, we're no worse off than if we'd done nothing; in fact, we're 0.85 better off even if AMZN continues lower. But the goal is to have AMZN rally a little bit, and the wonder of stock rehab using a ratio spread is that AMZN doesn't have to rally all the way back to our entry point, 390.00, for us to effectively sell our AMZN stock at an effective price that is above 390.00. If AMZN is above 370.00 at May expiration, then the 350/370 call spread that we paid 6.90 for will be worth 20.00. We collected 7.75 for selling that 370 strike covered call as well. Our effective selling price will be 390.85, and we realize that effective selling price as long as AMZN is above 370.00, meaning we'll have our stock called away, at May expiration. You can see this in Figure 14.11.

Below 390.85 this call ratio spread for stock rehab leaves us better off, and between 350.00 and 390.00 we're substantially better off. Below 350.00 we're only better off by the net of 0.85 collected, but we're certainly no worse off. As long as AMZN is above 370.00 at May expiration, we'll have our stock called away at an effective price

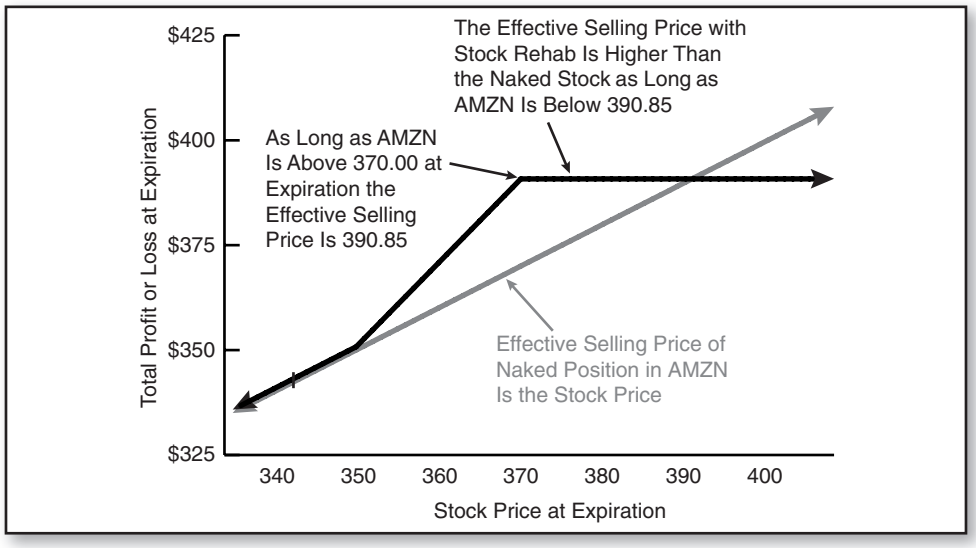


FIGURE 14.11 Effective Selling Price with and without Ratio Spread Stock Rehab

of 390.85, higher than our entry point of 390.00. As we've done before, we can use the tools at www.OptionMath.com to calculate the delta of that 370 strike call and thereby determine the likelihood that we'll sell our stock at that effective price of 390.85. If we do that, we find that likelihood is about 30 percent because the delta of the 370 strike call is 30. Not huge but certainly meaningful, and much higher than if we do nothing and wait for AMZN to actually get all the way to 390.85 before selling.

We've fully rehabilitated our stock position. A call ratio spread is no replacement for trading discipline and taking a loss when a trade isn't performing, but in situations like this, it can help save the day.

Back Spreads

In a ratio spread we buy one option and sell two options, what if we turn that around and sell one option and buy two options with the same expiration date but that are further out-of-the-money? This structure, short one option and long two farther out-of-the-money options is a back spread. A back spread is a trade that doesn't cost much to execute, like a ratio spread we'll put a back spread on for nearly zero net premium, and that makes a tremendous amount of money if the underlying stock moves enough but a back spread loses money if the underlying stock moves only a little bit, even if it moves in our desired direction. A ratio spread wanted relatively little volatility but in the desired direction; a back spread needs substantial volatility in the desired direction. Let's look at some options on Advanced Micro Devices (AMD), a stock that many consider a takeover candidate, and see how we can use them to establish a back spread. You can see these in Figure 14.12.

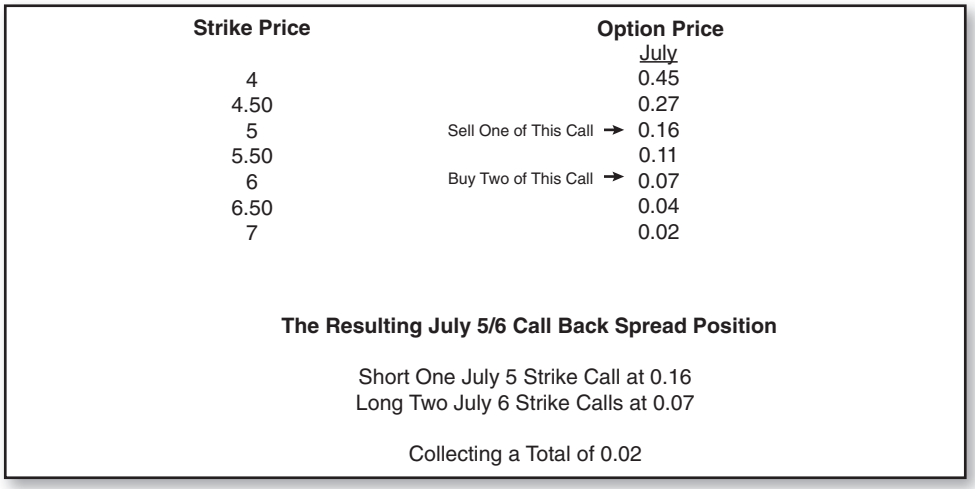


FIGURE 14.12 A July Call Back Spread in AMD

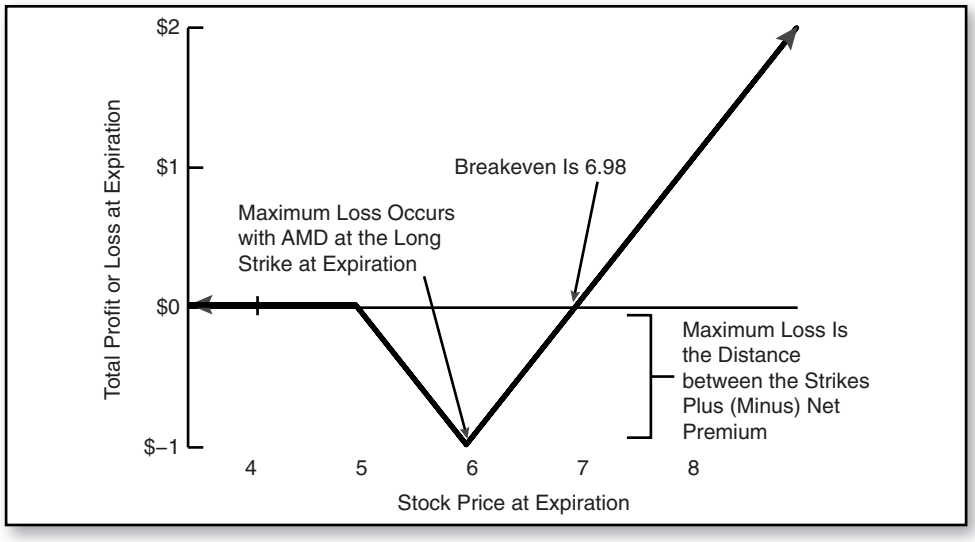


FIGURE 14.13 The AMD 5/6 Call Back Spread

We construct this July 5/6 call back spread by selling one of the July 5 calls at 0.16 and using that premium to buy two of the July 6 calls at 0.07 each. We collect a net of 0.02, but that's not how we make money with a call back spread. We want AMD to rally a bunch. What does this payoff look like? You can see the payoff chart for this back spread in Figure 14.13.

Once the underlying stock is above the strike price we're short, 5.00 in this case, the back spread starts to lose money and loses the maximum amount, 0.98 (the width of the back spread minus any net premium received or plus an net premium paid), when the underlying stock is precisely at the strike price we're long, 6.00. That makes sense, the 5 strike call we're short will be worth 1.00 there and the 6 strike calls we're long will be worthless. But once the stock rallies above the strike price we're long, 6.00 in this case, those calls start to have value at expiration. Breakeven is 6.98, and above there the profit for our call back spread continues to increase. Since we're long two options and only short one option, there's no limit to our potential profit. A back spread is a limited risk structure with essentially unlimited profit potential.

Let's use the tools at www.OptionMath.com to calculate the likelihood that this underlying stock will be above that 6.98 breakeven at July expiration. We find that likelihood of the underlying stock being above the 6.98 breakeven at expiration is only about 4 percent. That means back spreads are unlikely to generate a profit, but if they do, the profit can be substantial. Some traders like to use back spreads in stocks they consider takeover candidates. If a company is acquired then the jump in price is expected to get us into the profitable range and potentially into the very profitable

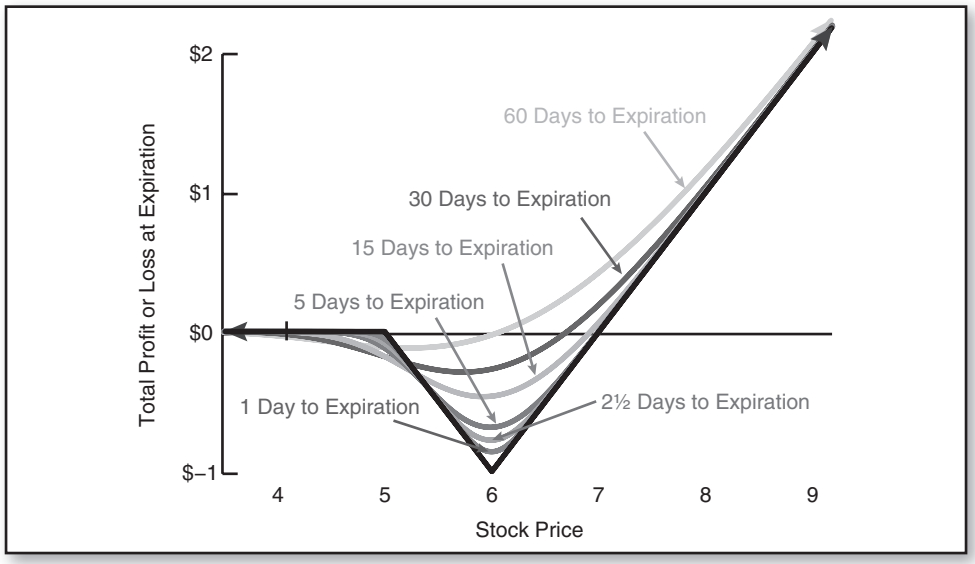


FIGURE 14.14 The AMD 5/6 Call Back Spread before Expiration

range. And if the company isn't acquired, it's unlikely that the stock will get much above the strike price of the call option we're short, meaning it's unlikely we'll sustain the maximum potential loss.

But enjoying a big move isn't the only way to make money using a back spread. We noticed that a call ratio spread loses money with significant time to expiration if the underlying stock rallies because the total delta of the call options we're short is greater than the delta of the call option we're long. We saw the result of this back in Figure 14.8. Our call back spread in AMD loses the maximum amount of money with AMD at 6.00 at expiration, but what if AMD is at 6.00 with a significant amount of time to expiration? We can see this in Figure 14.14.

With 60 days to expiration and AMD at 6.00, our back spread breaks even and with 60 days to expiration it makes money above that level. That's because the total delta of the calls we're long is now greater than the delta of the call we're short. Remember that delta is not only the likelihood that an option will be in-the-money at expiration; it's also the expected change in price for the option for each $1.00 change in the price of the underlying. We make money as AMD rallies, although erosion will start to kick in.

Unfortunately, the ratio spread is generally hurt by this difference in delta which is doubly painful because a ratio spread, which is short more options than it is long, is the spread we'd most like to be able to close prior to expiration in order to extinguish the risk from being net short options. And it's also unfortunate that the back spread is generally helped by this difference in delta despite our willingness to leave it on to expiration since we're net long options.

It is difficult to take a ratio spread off for a profit prior to expiration even though we might want to. It's much easier to take a back spread off for a profit prior to expiration even though we might be willing to leave it on. And it's much easier to take a back spread off as the time to expiration increases.

Super Back Spreads

A back spread is a volatility spread and a directional spread. It needs a lot of volatility and it needs it in the right direction, up for a call back spread and down for a put back spread. But the risk for a back spread is defined as we saw in Figure 14.13. What if we thought there was going to be a tremendous amount of volatility? Instead of selling a single option to buy two options we might sell a single option to buy three or more options (we could construct a back spread with nearly any ratio we wanted, for example selling two options to pay for three options or selling 1 to pay for 10, although that 1 × 10 back spread would behave like a single short, naked option over a huge range of prices for the underlying stock and would require a gigantic move in order to be profitable).

As we buy more of the option that is farther from at-the-money the cost of the "super back spread" will increase and we generally want a back spread to be done for little if any net premium if we're doing it at a debit, or we want it done at a credit. To offset the cost of the additional options bought and still execute our back spread for little if any net premium, it's necessary to buy options that are farther from at-the-money. Figure 14.15 shows some options in Abercrombie & Fitch (ANF), the teen retailer, that we might use to create some put back spreads and super back spreads.

We could create a typical back spread by selling one of the August 38 puts at 3.32 and using that premium to buy two of the August 34 puts at 1.72 each. The entire trade would cost 0.12. The breakeven would be 29.88 so ANF would have to be

Strike Price		August
29		0.64
30	Buy Four of This Put →	0.79
31		0.98
32	or	1.18
33		1.43
34	Buy Two of This Put →	1.72
35		2.07
36	and	2.45
37		2.86
38	Sell One of This Put →	3.32
39		3.90

FIGURE 14.15 Option Prices for Abercrombie & Fitch (ANF) Back Spreads

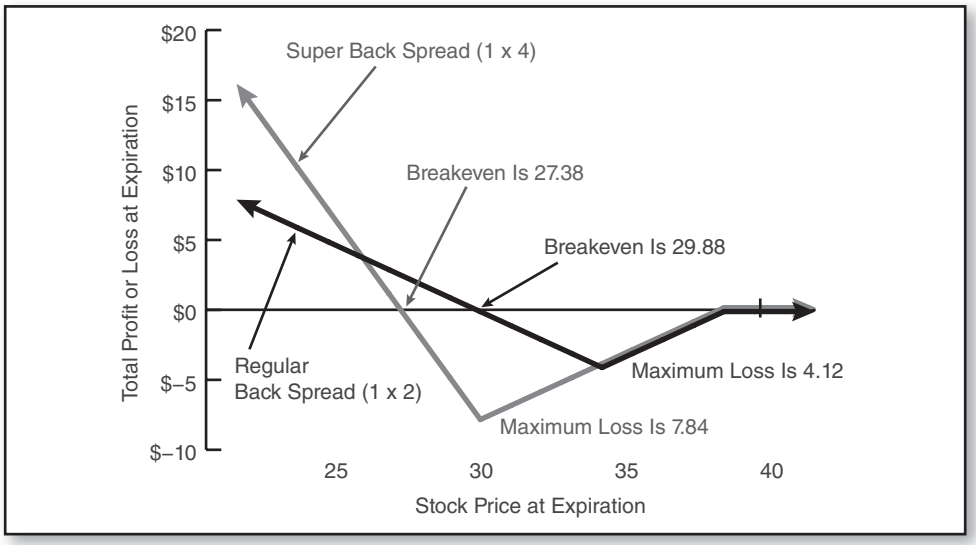
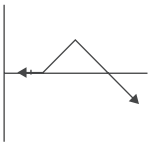
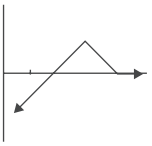


FIGURE 14.16 Abercrombie & Fitch Back Spread and Super Back Spread

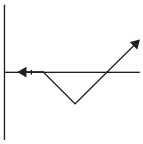
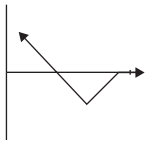
below 29.88 at August expiration in order for this put back spread to be profitable but if ANF dropped substantially, say to 25.00, then the profit would be 4.88. Or we could execute a super back spread by selling one of the same 38 strike puts at 3.32 and buying four of the 30 strike puts at 0.79. This trade would generate net premium of 0.16 and the breakeven for our ANF super back spread would be 27.38, ANF would have to drop quite a bit for us to break even, but if ANF was at 25.00 at expiration, our total profit would now be 7.16, and we would make more money for each $1 drop in the price of ANF. You can see the payoff for both back spreads in Figure 14.16.

A super back spread is trading more risk (7.84 maximum loss versus 4.12 maximum loss) for more potential return (7.16 profit versus 4.88 profit at 25.00). But we're counting on a lot of downward volatility for our super back spread to make any more than the 0.16 we get at execution.

Ratio Spread Cheat Sheet

	Call Ratio Spread	Put Ratio Spread
Description	Long one OTM call Short two further OTM calls	Long one OTM put Short two further OTM puts
Example	ATM = 100 Long one 105 call Short two 110 calls	ATM = 100 Long one 95 put Short two 90 puts
Pay or Collect Premium	Either is possible, net premium should be very small	Either is possible, net premium should be very small
Needed Directionality		
Passage ofTime without Market Movement	+	+
Increase in Implied Volatility without Market Movement	-	-
Payoff Thumbnail Chart		
Maximum Risk	Unlimited	Limited only because the underlying stock can not fall below zero
Maximum Profit	Higher strike price minus lower strike price minus (plus) any net premium paid (received)	Higher strike price minus lower strike price minus (plus) any net premium paid (received)
Breakeven Points	Higher strike price plus width of the ratio spread plus (minus) net premium received (paid)	Lower strike price minus width of the ratio spread plus (minus) net premium paid (received)

Back Spread Cheat Sheet

	Call Back Spread	Put Back Spread
Description	Short one OTM call Long two further OTM calls	Short one OTM put Long two further OTM puts
Example	ATM = 100 Short one 105 call Long two 110 calls	ATM = 100 Short one 95 put Long two 90 puts
Pay or Collect Premium	Either is possible, net premium should be very small	Either is possible, net premium should be very small
Needed Directionality		
Passage of Time without Market Movement	-	-
Increase in Implied Volatility without Market Movement	+	+
Payoff Thumbnail Chart		
Maximum Risk	Lower strike price minus higher strike price plus (minus) any net premium paid (received)	Higher strike price minus lower strike price plus (minus) any net premium paid (received)
Maximum Profit	Theoretically unlimited	Limited only because the price of the underlying stock can't drop below zero
Breakeven Points	Higher strike price plus width of the back spread plus (minus) net premium paid (received)	Lower strike price plus width of the back spread minus (plus) net premium paid (received)

CHAPTER 15

Other Spreads and Combinations

There are any number of additional ways to combine options into spreads and combinations. Some work to make use of the best attributes of other spreads, as a diagonal spread combines the best elements of a vertical spread and the best elements of a calendar spread. Some strive to take advantage of other elements that don't get much attention in option trading. For example, a box spread, even in the equity world, is really an interest rate play or a way for an option trader to borrow or lend money. Others don't have much to recommend them. A guts spread is a strangle in which both of the options are in-the-money; there are other ways to get the same or similar exposure without paying the penalty of the bid/ask spread for in-the-money options. And there are some combinations that may or may not be particularly useful but that have intriguing names such as Christmas tree, jelly roll, and stupid. Since every trader, even professionals, will have little call to use some of these, we'll cover each one briefly.

Married Put

You probably own stock. If you own stock and were worried that the price of that stock might drop, then you might sell a covered call although, as we saw in Chapter 4, that doesn't provide very much protection. You might buy a put but puts are expensive to always have in place, even if you buy longer-dated puts, which are cheaper than buying a series of shorter-dated puts. How expensive? Historically, if you'd

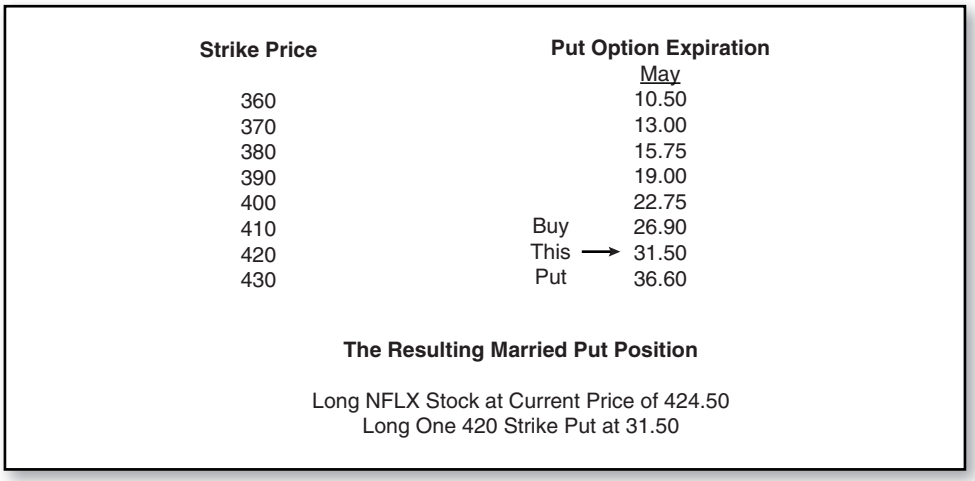


FIGURE 15.1 A Married Put on Netflix (NFLX)

bought an at-the-money one-year put on the S&P, that put would tend to cost about 8 percent of the value of the S&P. Sure, you'd be protected against any loss for the next 12 months but you'd have to pay for the put. And the historical annual return of the S&P during that period? About 8 percent. Your put would have eaten up all your stock gains.

But what if you had a large unrealized profit in a stock and didn't want to sell it, thereby realizing your profit for tax purposes, this year. Then you might decide to buy a protective put. This protective put is sometimes called a *married put* because the long stock position and the long protective put belong together. Figure 15.1 shows how we might construct a married put position.

We look at this trade as if we were long NFLX from its current market price of 424.50 because by not selling we're making a decision to stay long at that price, but when these option prices were observed, NFLX had just enjoyed a huge multiyear rally. Figure 15.2 shows the payoff for the married put position.

You'll notice that the payoff for a married put and a long call with the same strike price, 420 in this case, are identical. That's because a married put is a synthetic long call position. They both have risk limited to the amount of time value in the option and they both have unlimited profit potential to the upside.

Diagonal Spread

A *diagonal spread* is a hybrid of a vertical spread and a calendar spread. A diagonal spread buys one option and sells another option of the same type (put or call) but with a different expiration and a different strike price. It can take advantage of differential erosion by time to expiration, as we discussed in Chapter 6 when we examined

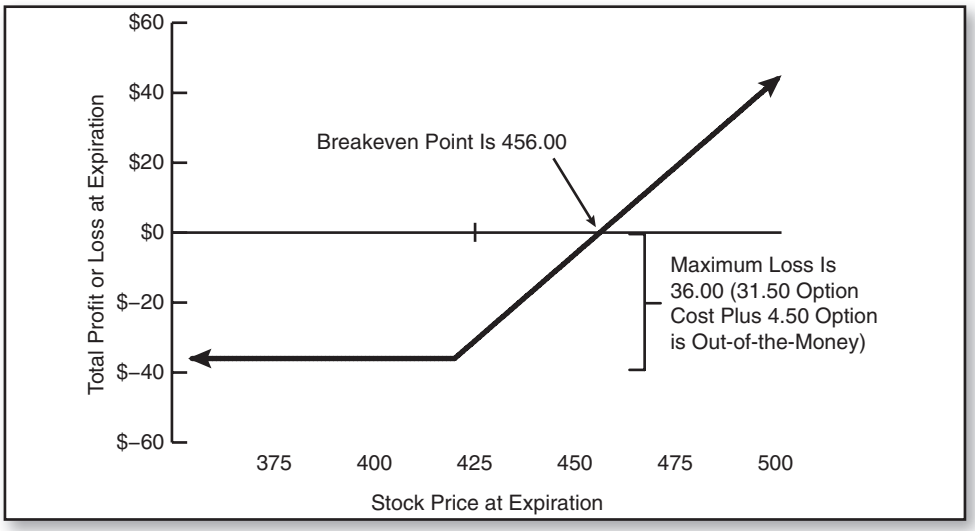


FIGURE 15.2 A Married Put on Netflix (NFLX)

calendar spreads, as well as the lower cost of a vertical spread. A long put diagonal can also take advantage of the relatively higher implied volatility of out-of-the money puts. Figure 15.3 shows how we might construct a call diagonal in XLF, the financial sector exchange-traded fund (ETF).

The resulting diagonal is long the June 22 strike call and short the May 23 strike call. This long call diagonal cost 0.46, and that's the maximum loss. The maximum

Strike Price	Expiration: May			Expiration: June
20	1.92			2.00
21	1.10		Buy	1.20
22	0.48	Sell &	This →	0.61
23	0.15 ←	This	Call	0.25
24	0.04	Call		0.08
25	0.02			0.04
26	0.01			0.02

The Resulting Call Diagonal Position

Long One June 22 Strike Call at 0.61
Short One May 23 Strike Call at 0.15

Paying a Net of 0.46

FIGURE 15.3 A Call Diagonal in XLF

gain is unlimited if the May call expires worthless because the resulting position is long the June call outright. The diagonal is nearly 25 percent cheaper than the June call by itself.

Charting the payoff for this call diagonal would require us to make many assumptions about where XLF was when the May option expired, the same sort of assumptions we discussed in Chapter 6 when we examined calendar spreads, so we won't draw a payoff chart but the goal for this diagonal is, as it is with a calendar spread, to have the front option expire worthless leaving us long the longer-dated option outright.

Iron Butterfly

A butterfly is a spread of two spreads; all the options are the same type and they share a center strike price. We discussed butterflies in Chapter 11. A condor is a spread of two spreads; all the options are the same type but they don't share a center strike price. We discussed condors in Chapter 12. An iron condor is a spread of two spreads; one spread is a call spread and one spread is a put spread and they don't share a center strike price. We discussed iron condors in Chapter 12. An *iron butterfly* is a spread of two vertical spreads; one spread is a call spread and one spread is a put spread, but they share a center strike price. Figure 15.4 shows some options in Exxon Mobil (XOM) that we might use to construct an iron butterfly, sometimes called simply an iron fly.

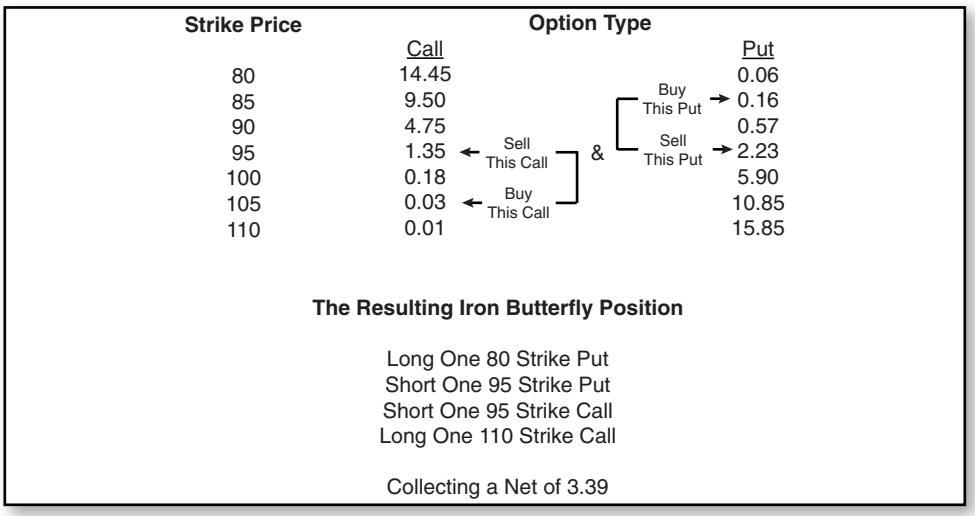


FIGURE 15.4 An Iron Butterfly on Exxon Mobil (XOM)

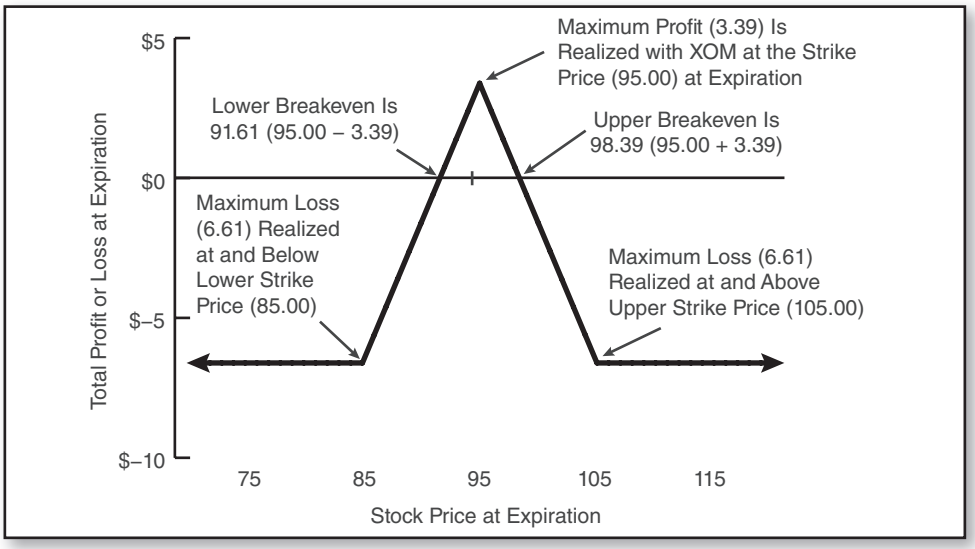


FIGURE 15.5 An Iron Butterfly in Exxon Mobil (XOM)

The goal is to collect most of the premium from selling that central straddle, the 95 straddle in XOM, while defining risk by buying that 85/105 strangle.

Figure 15.5 shows the payoff chart for this 80/95/110 iron butterfly in XOM.

An iron butterfly is usually constructed as you see in Figure 15.4, which sells the body and buys the wings to create a trade that collects premium and that's likely to generate a profit but that limits potential losses. Notice that the maximum potential loss is nearly double the maximum potential profit. You would only execute this trade if you expected little volatility.

Christmas Tree

A *Christmas tree* spread is similar to the ratio spreads we looked at in Chapter 14. In a long Christmas tree, we buy one option, either a put or call, that is fairly close to at-the-money and sell two options of the same type and expiration that are farther out-of-the-money but that have different strike prices from each other. The goal is to get exposure to a smaller move in the underlying without spending much in premium and to reduce risk by staggering the strike prices of the two short options. You would buy a Christmas tree only if you thought the underlying was unlikely to get to either of the strike prices of the two options we've sold. Figure 15.6 shows a long put Christmas tree in Costco (COST).

And Figure 15.7 shows the payoff chart for this long put Christmas tree.

A Christmas tree is a versatile structure. Figure 15.8 shows how we might construct a short call Christmas tree in Pfizer.

Strike Price	Option Type Put
90	0.33
95	0.55
100	Sell This Put → 0.90
105	Sell This Put → 1.65
110	Buy This Put → 2.95
115	5.10

The Resulting Long Put Christmas Tree Position

Long One 110 Strike Put
Short One 105 Strike Put
Short One 100 Strike Put

Paying a Net of 0.40

FIGURE 15.6 A Long Put Christmas Tree in Costco (COST)

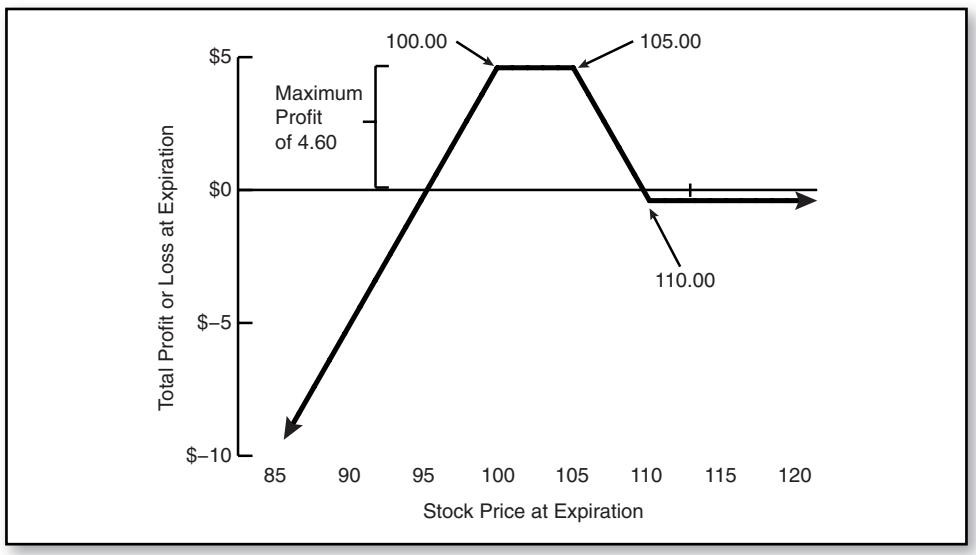


FIGURE 15.7 A Long Put Christmas Tree in Costco (COST)

This short call Christmas tree in Pfizer collects a net of 0.29 and so as long as Pfizer is below the lowest strike at expiration we'll pocket that premium. This short call Christmas tree losses money between 33.29 and 38.71 but above there the profits are unlimited. You can see this in Figure 15.9.

Strike Price	Option Type Call	
31	1.44	
32	0.95	
33	0.60	Sell This Call →
34	0.37	
35	0.22	Buy This Call →
36	0.14	
37	0.09	Buy This Call →
38	0.06	

The Resulting Short Call Christmas Tree Position

Short One 33 Strike Call
Long One 35 Strike Call
Long One 37 Strike Call

Collecting a Net of 0.29

FIGURE 15.8 A Short Call Christmas Tree in Pfizer (PFE)

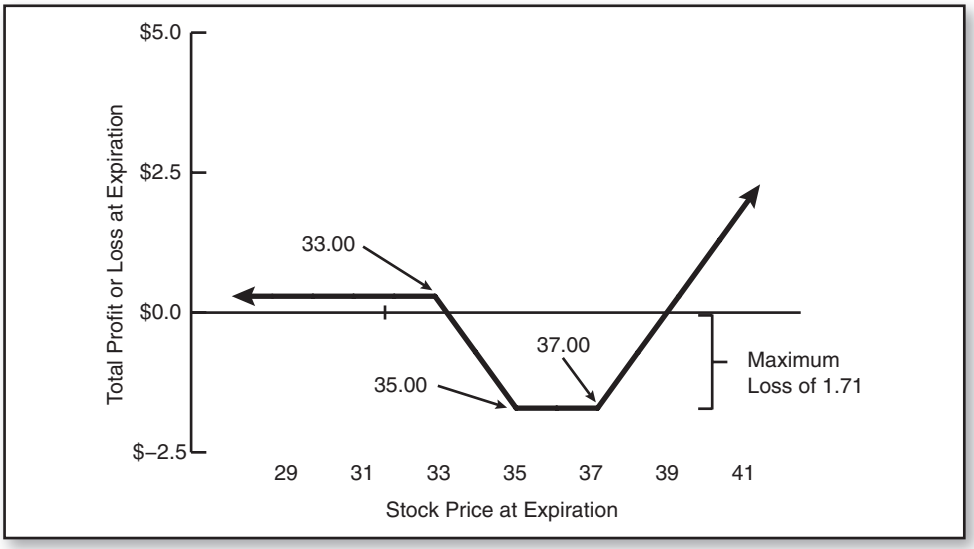


FIGURE 15.9 A Short Call Christmas Tree in Pfizer (PFE)

Box Spread

In Chapter 13, we looked at conversions and reversals and saw how we could use options to create a synthetic long or short position in the underlying stock using nothing but options. The call and put that we use to create the synthetic position share an

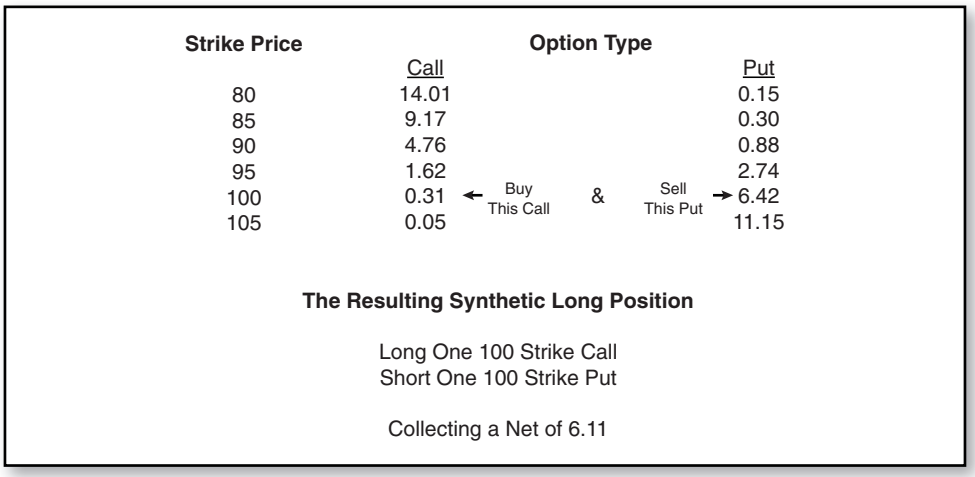


FIGURE 15.10 A Synthetic Long Position on Johnson & Johnson (JNJ)

expiration date and strike price. For example, Figure 15.10 shows how we might use options to create a synthetic long position in JNJ with the stock at 93.88.

These options had 40 days to expiration. We could buy the 100 strike call at 0.31 and simultaneously sell the 100 strike put at 6.42 (we're ignoring the impact of the bid/ask spread). We collect a net of 6.11. If JNJ is below 100.00 at expiration, we're going to buy the stock at 100.00 because we'll be assigned on our short put. If JNJ is above 100.00 at expiration, we're going to buy the stock at 100.00 because we'll exercise our call. Unless JNJ is precisely at 100.00 at expiration, we're going to buy JNJ at 100.00. But we get to keep that 6.11 for those 40 days, meaning that money will be sitting in our account earning interest. But that interest doesn't cover much of our risk from being synthetically long JNJ. So what if we executed a similar synthetic short position and collected more premium by selling an in-the-money call option and buying an out-of-the-money put option? That complete position would be a box spread. You can see how we complete the JNJ box spread in Figure 15.11.

We collect and keep a total of 14.98, which is good, but at expiration we're going to buy 100 shares of JNJ at 100.00 thanks to the synthetic long position, and we're going to sell 100 shares of JNJ at 85.00 thanks to the synthetic short position of short the 85 strike call and long the 85 strike put. We collected 14.98 in option premium and lost 15.00 on our stock. But we had that 14.98 in our trading account, earning interest for the 40 days we had the trade on. It's no accident that the interest earned on 14.98 for 40 days at 1 percent, the risk-free rate when these option prices were observed, is about 0.02.

A box spread is an interest rate trade even when we make it in an equity name like JNJ. A box spread is appropriate only for professional traders with very low execution costs. Otherwise, the cost of executing the trade will cost many times what the trade generates in interest.

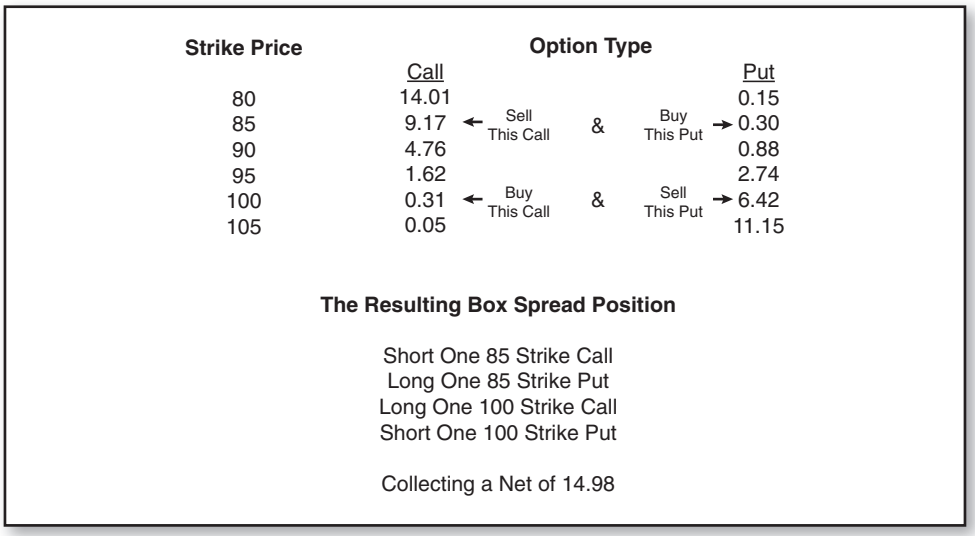


FIGURE 15.11 A Box Spread in Johnson & Johnson (JNJ)

Jelly Roll

A *jelly roll,* sometimes simply called a roll, is very similar to a box spread in that it has a synthetic long position and a synthetic short position but the two synthetic positions have different expirations. Jelly rolls can be used to get long stock via a synthetic long position which is hedged via a longer-dated short synthetic position or vice versa. The price difference between the two synthetic positions will be greater than in a box spread in order to offset the carrying costs of the stock position between the first expiration and the second expiration.

Jelly rolls are generally used by professional traders who have delta exposure in an expiring option month that is offset by delta exposure in a later expiration. Since the expiration of the front month would result in a large net delta exposure, exposure to the raw directional moves of the underlying stock, professionals will use a jelly roll to move the delta exposure from one month to another, offsetting the exposure in both months leaving no net delta exposure once the front month expires.

Stupid

If you can't make up your mind which strike to buy what are your alternatives? Well, you might just decide to buy more than one strike. That would be an option *stupid,* sometimes called an option double. Figure 15.12 shows how you might use options on Visa (V) to execute a put stupid.

Strike Price	Option Type Put	
175	0.79	
180	1.01	
185	1.33	
190	1.76	Buy This Put →
195	2.33	&
200	3.09	Buy This Put →
205	4.13	
210	5.35	
215	7.10	

The Resulting Put Stupid Position

Long One 190 Strike Put
Long One 200 Strike Put

Paying a Total of 4.85

FIGURE 15.12 A Put Stupid on Visa (V)

And Figure 15.13 shows the payoff for this 190/200 put stupid as well as the payoff for simply buying two of the 195 put. Above the 200 level and below the 190 level the two payoffs are very similar but not identical. It's really between the strike prices of the stupid that you can see the difference and this is the range where the put stupid buyer is looking for a different sort of payoff.

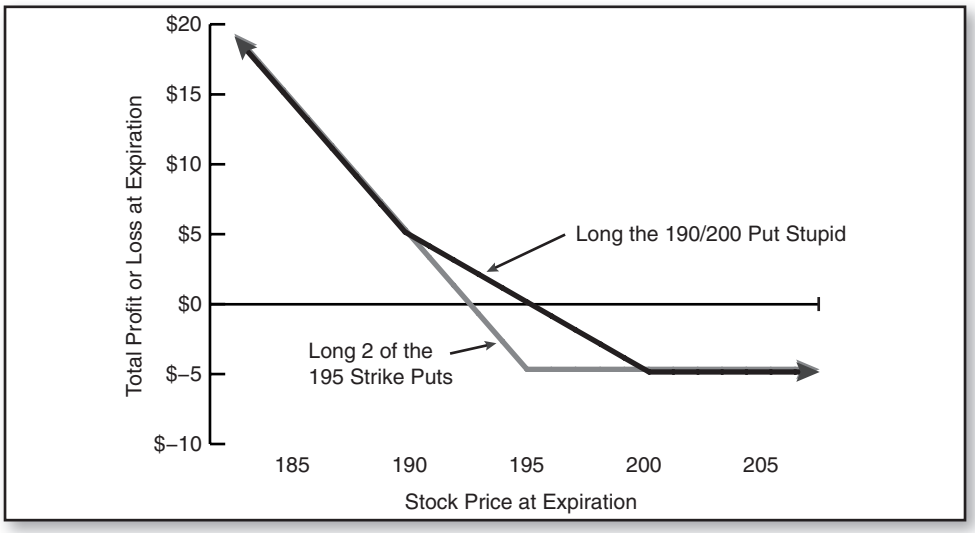


FIGURE 15.13 A Long Put Stupid in Visa (V)

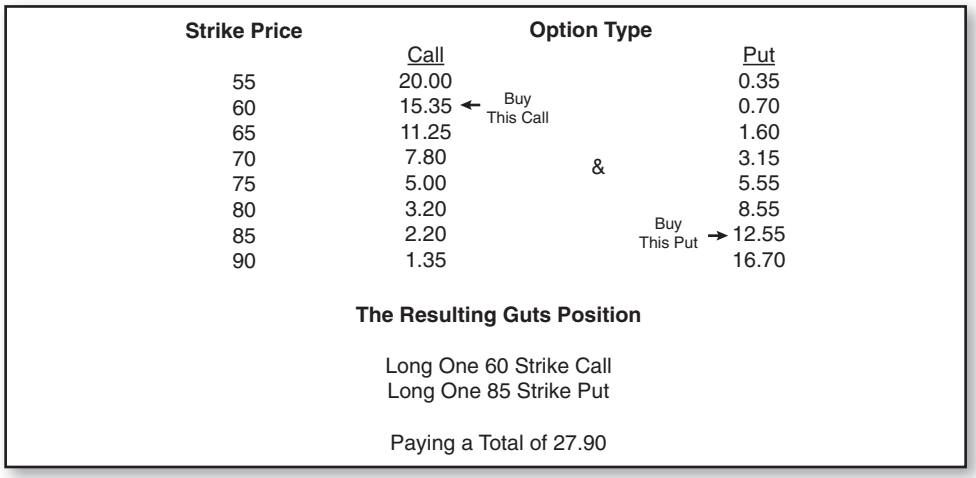


FIGURE 15.14 A Guts in Starbucks (SBUX)

Guts

A guts spread is a combination of a long in-the-money call and a long in-the-money put. The options have the same expiration but will have different strike prices. A *guts* is very similar to a strangle, although in a strangle both of the options are out-of-the-money. Figure 15.14 shows how we might construct a guts in Starbucks (SBUX) when SBUX was trading at 74.65.

This 60/85 guts cost a total of 27.90 and can result in one of several different positions at expiration. If SBUX is between the strikes then we'll end up with no position because we'll exercise both options, buying SBUX at 60.00 and selling it at 85.00. If SBUX is below 60.00 at expiration, then we'll be short the stock because we'll exercise our put but let our call expire worthless. If SBUX is above 85.00, then we'll end up long the stock since we'll exercise our call and let our put expire worthless. Figure 15.15 shows the payoff for this 60/85 guts.

The maximum loss is the 2.90 in time value paid, 0.70 in the call and 2.20 in the put. The payoff looks very similar to a strangle. In fact, if we were to graph the 60/85 strangle, you would see that the guts and the strangle lie precisely on top of each other. There is no difference in the two trades.

Other Potential Spreads and Combinations

As we've seen, there's a nearly infinite way to combine options into spreads and combinations. You could sell a straddle in the front month and buy a straddle with the same strike price in a later expiration. You might call this a straddle calendar. You

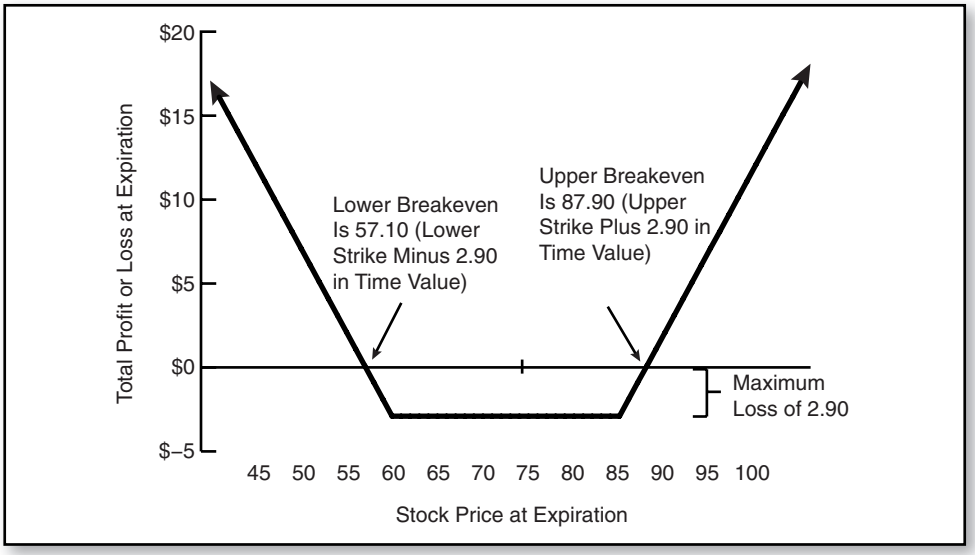


FIGURE 15.15 A Guts in Starbucks (SBUX)

might do the same with strangles and you could vary the width of the strangles so that you did the trade for very little or no premium out of pocket.

You're now ready to combine all the underlying, options, spreads, and combinations in more sophisticated trade structures that are precisely aligned with your outlook for the market you're trading. Use the tools at www.OptionMath.com to determine the greeks for the structures you're contemplating then be disciplined in your trading and with the flexibility of spreads and combinations you're on your way to profitable option trading. Good luck.

ABOUT THE WEBSITE

The website at www.OptionMath.com was originally created as a companion to my first book, *Options Math for Traders,* and it's been revised, extended, and updated to serve as a companion to this work as well. You'll find option price and data spreadsheets that will allow you to price options given all the required inputs and we'll guide you on selecting those inputs. The spreadsheets also help you determine just how volatile the options on a particular stock or ETF say that stock or ETF is going to be for the term of the option. This is a little like peering into the future with the options telling us what to expect.

The website also provides all the cheat sheets that follow each strategy chapter, but like most things, the real understanding comes from the reading and understanding of the material, not from perusing the cheat sheets, which are intended to distill the information from the chapter, not to replace it.

Finally, the web site will include annotated examples of all the option spreads and combinations we discuss, including actual recent notable option trades including commentary about the trade, the risks and potential rewards, why it might have been made, and the math advantage or penalty inherent in it. It's an opportunity to look over the shoulder of professional option traders.

You'll also be able to discuss option trading with us and e-mail your questions because options are an incredibly useful tool. Let's get started using them.

ABOUT THE AUTHOR

Scott Nations is best known as one of the cast of CNBC's *Options Action* and from his regular appearances on CNBC's *Fast Money, Futures Now,* and *Squawk Box* programs, but he was an option trader in the pits of the Chicago Board of Trade and Chicago Mercantile Exchange for over two decades.

Today, Scott is the chief investment officer of NationsShares, the world's leading independent developer of volatility-based and option-enhanced indexes. As the head of NationsShares, Scott has created VolDex® (ticker symbol: VOLI), an improved measure of option implied volatility; SkewDex® (ticker symbol: SDEX), the best measure of option skew; TailDex® (ticker symbol: TDEX), the first measure of the risk of a "black swan" event in the stock market; and TermDex®, the first quantitative measure of the term structure of option markets. Scott is also the creator of the Enhanced Covered Call, Enhanced Collar, and Better Beta® Option Levered strategies.

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