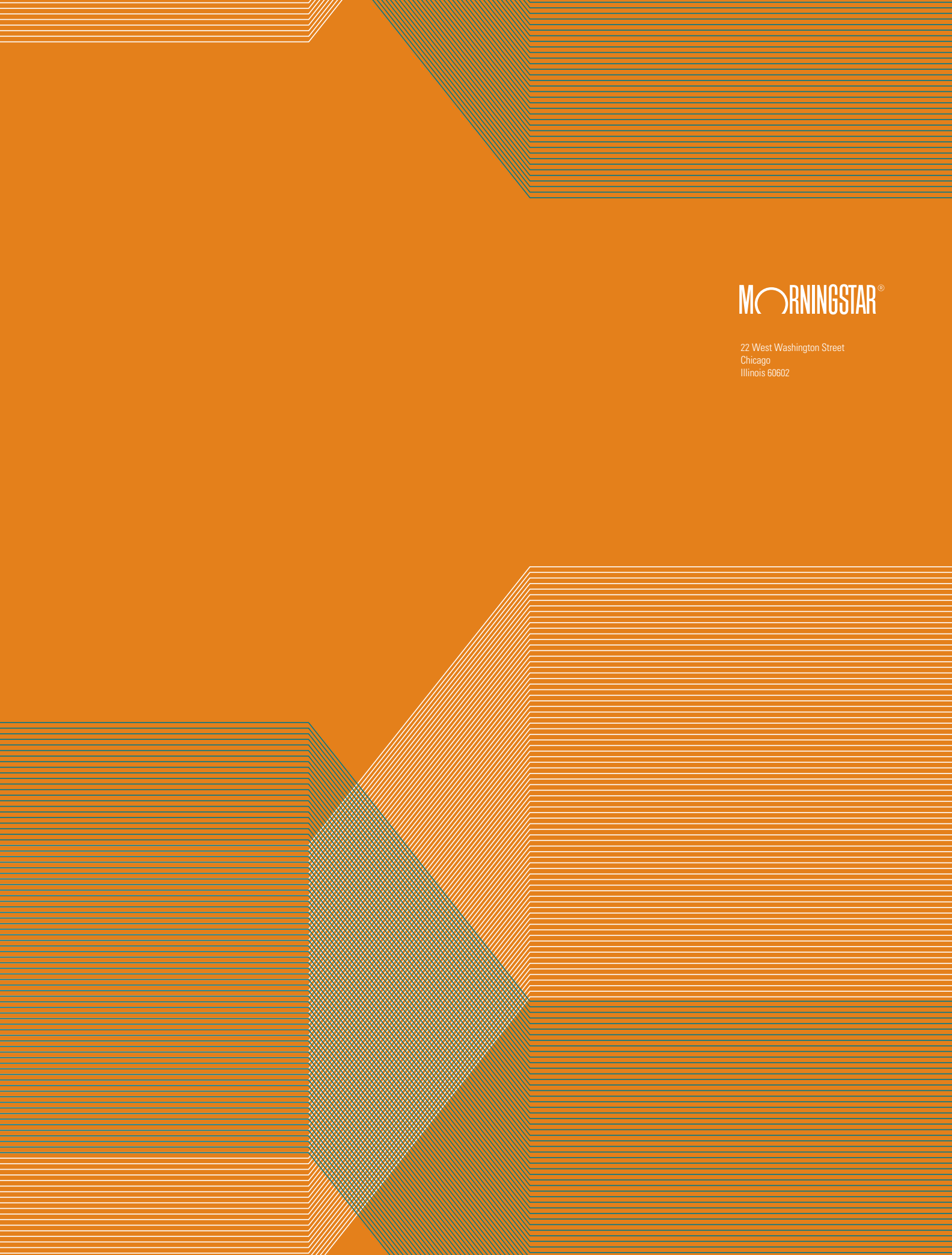

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Morningstar Guide to Equity Option Investing

by Philip Guziec, CFA, Derivatives Strategist

Introduction

Philip Guziec, CFA, Derivatives Strategist

Hi, I'm Philip Guziec, Morningstar derivatives strategist and editor of *Morningstar OptionInvestor*. I've developed this guide to help you understand the basics of the option market and the principles I'll be using to approach the option market from the perspective of a fundamental investor.

For new option users, I hope this guide will help you to develop a clear and intuitive understanding of how options work and how they can be used by investors. For more experienced option investors, I hope this guide provides insights and perspectives you may not have seen before.

I have brought together an intuitive framework for analyzing options in a rigorous way, tied to fundamental analysis, and I'll show you how to exploit many of the more short-sighted or implausible aspects of "typical" options analysis. Some of the perspectives may be different than what you are used to.

I won't promise that you'll get rich quick by using options (for thorough debunking of get-rich-quick sales schemes using options, see Appendix 1) but I will promise to lead you through fundamentally sound option investing strategies that can generate solid investment performance over the long run.

Also, I'd like to take a minute to thank Morningstar's Senior Options Analyst, Erik Kobayashi-Solomon, for his tremendous contributions of examples, editing, prose and perspective.

What the Heck is an "Option Investor"?

I once heard an interesting distinction made between investing and gambling: If you can reasonably expect to win on average, it's investing. If not, it's gambling. My mission is to help you invest in options, not gamble with them. The key is to invest in options only when you have an edge—an insight that gives the investment a positive expected return. Some options investments may be very risky, or they may have a short time horizon, but option investors are willing to make those investments if they understand the source of their edge through fundamental research. By driving *OptionInvestor* with fundamental research, we'll be using options to invest, not to gamble.

The 10 Key Principles to Option Investing

The number-one objective of this guide is to help you develop an intuitive understanding of stock options. By intuitive understanding, I do not mean a "gut feel" or a "trader's instinct." That's hokum. I mean a fundamentally sound understanding of the theory and practical use of stock options. Although stock options can seem intimidating at first blush, they really are understandable—I promise!—and they can enable you to generate profits in bull or bear markets. In addition, I think the key insights that come from understanding options can (and will!) improve your stock-investing skills as well.

I've distilled this guide down to 10 key principles. Once you have developed a strong grounding in the use of options through these 10 principles, you'll be able to see how analysis of the fundamentals of the underlying company, and therefore the future of the stock price, can be transferred to an investing edge in the options market.

In contrast, there are a myriad of books on the basics of stock options, and many of them do a good job explaining the mechanics of options in a traditional theoretical framework. In this guide, however, I'll be trying to instill a fundamental, intuitive understanding of options, augmented by some simple examples, rather than plowing through detailed numbers and models.

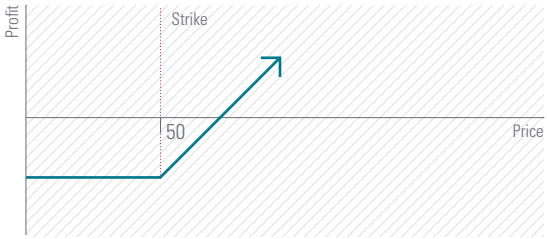
Some traditional explanations of the option basics can be found on www.morningstar.com/Cover/Options.aspx.

Principle 1: Understand Upside and Downside

The textbook definition of an option is:
The right, but not the obligation, to buy or sell a specified asset at a predetermined price over a predetermined time.

While the definition is precisely correct, it makes my eyes roll when I read it. Let's see if we can develop a better working definition.

Calls: The Upside



I think about calls as "the upside" on a stock. Let's walk through a comparison between a stock investment and an options investment to understand what I mean by "the upside."

Let's say you're considering buying stock in XYZ, which is trading at $50, and you think the company is undervalued. You believe that the valuation will return to normal over the next year. If you buy the stock for $50, you put $50 at risk and you hope that the share price rises over the next year, earning you a profit on your $50. Of course, if the stock price declines over the next year, you lose some of your $50.

Alternatively, let's say someone agrees to pay you all of the return above $50 over the next year. If the stock price rises to $60, he will pay you $10. If the stock price declines below 50, he won't pay you anything, and you don't owe him anything. In this example, he's giving you the the upside on the shares of XYZ. Anything above $50 is yours to keep.[1]

Let me repeat that: He's giving you the upside on XYZ above $50 for the next year. This is also known as a 50 strike one-year call option. Traditionally, a call option is depicted graphically on a "payoff diagram," as shown in our example. In a payoff diagram, the stock price at expiration is shown on the x axis and the profit is shown on the y axis.

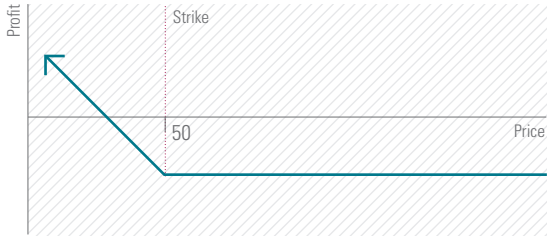
The payoff diagram shows a payoff starting at $50, and rising toward the right.

Obviously, someone is not going to agree to give you the upside from $50 over the next year without some compensation in return, which is why the payoff line starts below zero. Someone is going to require you to pay him for that right to the upside, and this distance below zero is the price you have to pay for the option. The real question—and the key to options investing—is deciding what the upside is worth, and comparing that with the price the seller is trying to charge you. That's what separates the investors from the gamblers when it comes to options investing.

We'll get into that discussion later, but simply keep in mind that there's some price to be paid for the "right to the upside."

[1] The mechanics of the actual transaction to capture the upside are slightly more complex than I've laid out here because technically, the option seller agrees to give the option buyer the shares for $50, or allows the buyer, to "call" the shares away at $50, hence the name "call" option. If the stock price is at $60, by calling the shares away at $50 and reselling them, the buyer can capture the upside I've been discussing. For practical purposes, however, the call owner can sell the stock immediately after calling it, and it is so much simpler to think of the definition as the "upside."

Puts: The Downside



Just as I think about calls as "the upside" on a stock, I think of puts as "the downside" on a stock.

For example, let's say you're considering selling stock in XYZ, which is trading at $50, because you think the company is overvalued and that the stock price will fall over the next year. If you sell the stock short at $50 (selling a stock short is selling the shares in the hope that you can buy them back later at a lower price, making a profit), you take a risk that the stock will rise above $50, in which case you will lose money.

But let's say I agree to pay you the entire stock price decline from $50 over the next year. If the stock price falls to $40, I will pay you $10. If the stock price rises above $50, I won't pay you anything, and you don't owe me anything. In this example, I've given you the *downside* on the shares of XYZ *below $50*, without forcing you to assume any of the risk to the upside.[2]

Again, let me repeat that: I've given you the *downside on XYZ below $50 for the next year*. What I've given you is also known as a *$50 strike one-year put option*.

[2] Again, the mechanics of the transaction are slightly more complex. Technically, the option seller agrees to let you, the put buyer, sell the shares for $50, or "put" the shares to the option seller for $50, hence the name "put" option. For practical purposes, however, the put owner can buy the stock and immediately put it to the put seller, which produces the profit from the drop in the stock price. It is much easier to think of a put as "the downside."

Principle 2: Value Options Using Company Fundamentals

Now that we've established that a call is the upside from a strike price, and a put is the downside from a strike price, I can tackle the question of how to determine what the upside and the downside are worth. Remember, this is the key to investing—as opposed to gambling—with options.

There are many different ways to estimate the value of an option, but I like to boil them down to two distinct methods: the fundamental view of options and the statistical view of options. Despite the fact that the options market revolves almost entirely around a statistical view of the world, we'll begin by describing the world from a fundamental perspective, both because it is easier to understand and because it closely aligns with the way I use Morningstar research to uncover investment opportunities.

Options Pricing in Plain English

If the stock of a company is currently trading at $50, how much would you pay someone for the upside above $50 for the next year?

Let's start with a simple example:

A Tale of Two Tickers

Gizmo Inc. is just about to launch a new fashion line, "New Gizmo," and its stock price is trading at $50. All fashion retailers are exposed to the latest fads, and Gizmo is no different: Its new fashion line could be wildly profitable, or it could be a complete dud.

You can think about the present stock price of $50 as an average of Gizmo's potential stock prices in the future, weighed by the probability of each price. To the upside there might be a 10% chance that Gizmo's new line will be a huge hit and will support revenues and profits enough to drive the stock price to around $500. To the downside, there might be a 90% chance that Gizmo flops and the stock is worth zero.

A 10% probability of a $500 stock price is worth:
10% * $500 = $50

A 90% chance of $0 is worth:
90% * $0 = $0

Adding the two together:
$50 + $0 = $50 *(the present market price)*

Another company, SugarWater Inc., is also trading at $50. SugarWater Inc. is in the business of selling SugarWater: It has been selling it for 100 years and sells pretty much the same dollar amount of SugarWater every year, plus or minus a few percent. This year the company has a 50/50 chance of 0% growth or 3% growth, and the stock would either be worth $45 or $55, respectively. Again, we are just taking the estimates of the possible outcomes and their probabilities and combining them, we get:
(50% * $55) + (50% * $45) = $50

Let's compare a call option on Gizmo with a call on SugarWater. Both stocks are trading at $50, but we're looking to put a value on "the upside" from $50 over the next year. For these two companies, we should be willing to pay very different amounts for the upside.

If Gizmo's new fashion line is a big hit, it will have a $500 stock price by the end of the year, and the upside in that case is $500 minus the present market value of $50, or $450. If our probability estimate of a 10% chance of that upside scenario turns out to be correct, then using the same probability weighting I spelled out earlier, the upside should be worth $45:
10% * $450 = $45

What about SugarWater? If it comes through with 3% growth, the stock has an upside of $5:
$55 – $50 = $5

If our 50% probability estimate of the upside scenario turns out to be correct, then the option should be worth $2.50:
50% * $5 = $2.50

As we can see, the two stocks have the same price, but the upside—or call options—are worth very different amounts. The options on SugarWater are less valuable because the value of Sugar-Water's stock is relatively certain, while the value of Gizmo's stock is very uncertain.

This is the key intuition behind the valuation of an option! The higher the uncertainty about the value of a stock, the more valuable the option. All other things held equal, a higher option price implies that there is a much wider distribution of possible out-comes for a certain stock.

Principle 3: Understand Statistical Valuation

Given that the options market revolves around a statistical view of the world and models that turn these statistics into option values, it makes sense to understand how the statistical model works.

In the 1970s, several academics—Fischer Black, Myron Scholes, and later, Robert Merton (BSM)—developed a statistical model for valuing options. Despite a number of oversimplified and unreasonable assumptions, the BSM model now serves as the baseline for valuation in the options market, primarily because it allows investors to compare different options using a common measure of price.

The Intuition of the Equation

At the root of the BSM model is a very simple idea. The value of an option depends upon four elements:

1. The relationship of the price of the underlying stock to the option's strike price
2. The time remaining before the option expires
3. The interest rate on borrowed funds
4. How much the stock is expected to vary over time

The idea that option values depend on the value of the underlying stock and the time to expiration is certainly not rocket science—this insight had been the basis for thousands of years of "rule-of-thumb" valuations, in fact. The real brilliance in the work of Black, Scholes, and Merton was to build a mathematical model that quantifies the value of the likelihood that a stock will pass a given price, and by how much.

The cost of borrowing funds turns out to be the least-important factor in most cases and also involves some fairly arcane arguments regarding "risk-free portfolios" and "arbitrage." We can ignore that.

The intuitive relationship between the stock price and option strike price is relatively clear. Think about this: You are offered a call option to buy shares of PDQ company for $100. Wouldn't that option seem much more valuable to you if PDQ shares were trading at $98 than at $2? At $2, the likelihood that the stock will go above $100 any time soon is much less than if the stock is trading at $98. So if the stock is at $2, the option is worth much less.

The relationship between time to expiration and option price is similarly intuitive. You are offered the call option to buy PDQ stock for $100. PDQ stock is trading at $75 per share. Think about the value of the option if it expired tomorrow versus the value if it expires three years from now. The likelihood that a stock's price will jump from $75 to $100 in a single trading day is much less than the likelihood that it will pass $100 in three years, so the three-year option is worth more.

Finally, there is how much the stock is expected to move over time, or volatility. Volatility is the BSM model's measure of uncertainty about the outcome of the stock price. As we discussed in our fundamental approach to pricing options, the more uncertain the outcome, the more valuable the option, the higher the implied volatility. Therefore, I find implied volatility useful not only as a common measure of option price, but also as an intuitive number that quantifies (though poorly) the uncertainty about the stock price.

Principle 4: Understand How the Market Prices Options

Now that we understand the intuition of fundamental and statistical valuation of options, let's see how the market prices options in the real world.

Of the four elements that drive the statistical valuation of options—the relationship of strike price to stock price, time to expiration, borrowing rate, and volatility—three are known by both parties when an option transaction takes place. Only the future volatility is unknown by both buyer and seller.

It turns out that this uncertainty about future volatility levels means that option transactions can be thought of as transactions involving a peculiar commodity called implied volatility.

Buy Low, Sell High

An option buyer thinks the volatility implied by the option price is lower than the actual volatility of the underlying stock. He wants to buy an option because he thinks its value is based on an assumption for future volatility that is too low. In other words, he buys low.

Conversely, the seller thinks the option price implies too high a level of volatility—that future volatility will actually be lower. As such, he becomes a seller. He sells high.

What's the Right Volatility Level?

To estimate the future volatility of a stock, it's reasonable to assume that we can look at how volatile it has been in the past. The degree to which the stock has moved around in the past is called the "historical" or "realized" or "statistical" volatility. For a more thorough treatment of realized versus implied volatility, refer to Appendix 3.

But as we all know, past performance is not indicative of future results. So rather than using historical volatility directly, people valuing options use a hybrid approach. Buyers and sellers look at the price of an option and back out the volatility level that will make the option trade at this price (this is the volatility "implied" by the market price or "implied volatility"). Then, they might compare the implied volatility with the historical volatility of the stock, taking into account their view of what will likely happen to the firm in the future, and ask themselves "Is this a reasonable amount of volatility to expect in the future?"

Another Look at Gizmo and SugarWater

Let's return to Gizmo and SugarWater. The fate of Gizmo is tied to its new line of products, and the range of possible outcomes is very wide. The Gizmo options will be very expensive, and if we back out the implied volatility, we will find that it is greater than 100%.

Steady-Eddie SugarWater, on the other hand, has little expected variability in its economic results, so the options are priced such that the implied volatility is much lower—more like 20%.

Naturally, the share price of Gizmo will tend to bounce around much more than the share price of SugarWater, as the market reacts to little bits of news, rumors, and mood swings regarding the latest fashions. Therefore, the statistical volatility of Gizmo will likely be much higher than that of SugarWater, aligning with the option market's conclusion about implied volatility.

In both of these cases, market participants are looking at both the range of outcomes for the stock price as well as the stocks' statistical volatility to develop an idea of what volatility will be in the future.

What if the Market Is Wrong?

I believe that this description of how things work in the options market points to an excellent opportunity for farsighted investors to outperform. Specifically, most users of the BSM model look mainly at the most recent price of a stock and try to think about volatility in terms of uncertainty regarding the recent stock *price*.

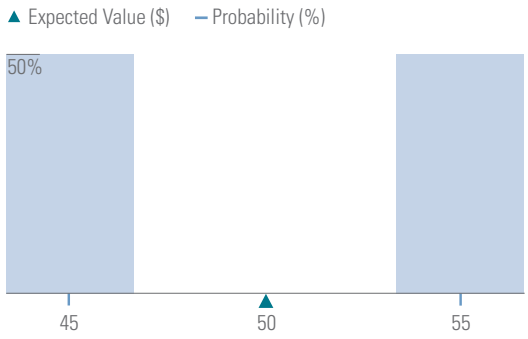
But what if that stock price is wrong to begin with? What if the market has mispriced the stock?

I believe that companies have an intrinsic value toward which the market price for the companies' stocks will, over time, gravitate—irrespective of rumors, fads, and panics in the general marketplace. Furthermore, as I discussed in the section on fundamental valuation above, I believe it is possible to understand the range of outcomes for a company's value based on the company fundamentals. I prefer to look at what the fundamental value of a given company is based on its future long-term performance, considering what I know about the relative probability of future outcomes. Then I handicap *that* fundamental value with a fundamentally derived level of uncertainty—not simply the volatility based on historical wiggles in the stock chart. Instead of realized volatility, I focus on this question: How difficult is it to bound the range of the future value of the company?

Principle 5: Visualize Option Positions

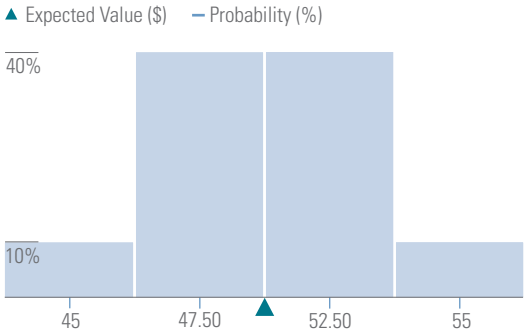
To develop a better intuition about implied volatility, we've developed an options graphic that shows the probability distribution of a stock price.

Two-Outcome Probability Distribution



As we've already discussed, the price of a stock is equal to the expected value of the distribution of potential outcomes for the stock price at the option expiration. As a simple example of expected value, SugarWater has a 50% chance of being worth $45, and a 50% chance of being worth $55. It therefore has an expected value of $50, and a probability distribution with only two outcomes. You can think of the expected value of a two-outcome probability distribution as the balance point of a teeter-totter, with each outcome on either end.

Four-Outcome Probability Distribution



As we increase the number of potential outcomes and probabilities, we get a smoother distribution. For example, if the stock now had a 10% chance of being worth $45, a 40% chance of being worth $47.50, a 40% chance of being worth $52.50, and a 10% chance of being worth $55, the distribution would look like the one shown. You can think of the expected value of a stock price distribution as the point under the edge of the distribution where you could place a knife edge, and the distribution would balance perfectly.

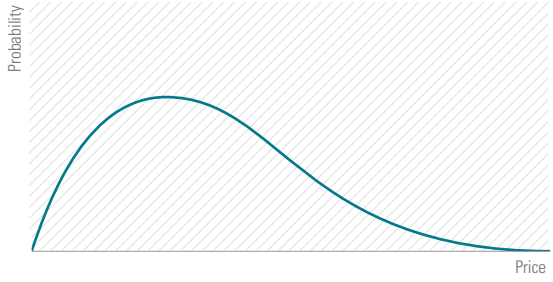
Stock Prices and the Log-Normal Distribution

As we add more and more potential outcomes and probabilities, the shape of the curve smooths out, eventually producing a continuous distribution when we have an infinite number of potential outcomes. In theory, this distribution of potential outcomes can have any shape, but the price distribution that aligns with the assumptions of the BSM model is called log-normal. And in fact, the distributions implied by the options market typically look approximately log-normal, as shown below.

Although a log-normal probability distribution may look a little different from the bell curve we are all used to seeing, the shape actually makes a lot of sense. You'll notice that the potential prices shown in the distribution stretch way out to the right. Log-normal is the nature of stock prices for a very simple reason: Stocks can only go as low as zero, but they can theoretically rise to any level. (See my appendix on the drunk.) In terms of return, this means that a stock can only have a -100% return (fall to zero), but there is no limit to the return on the upside.

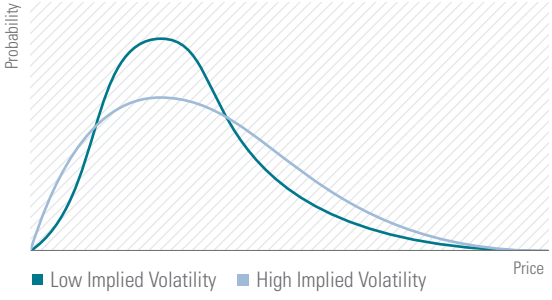
Uncertainty
High Uncertainty = Wide Distribution

Log-Normal Probability Distribution



So how does this all relate to implied volatility? The implied volatility is simply a measure of the width of the stock price distribution relative to the expected value, or balance point of the distribution. It's worth repeating: Implied volatility is simply a measure of uncertainty, or a measure of the width of the stock price distribution. As we can see in the figure below, with the same stock price, as implied volatility increases, the distribution of potential outcomes gets wider and lower.

Two Distributions With Different Implied Volatilities



Because the width of the probability distribution of the stock price is independent of the stock price itself (the expected value of the distribution), the uncertainty about a stock price as measured by the implied volatility is theoretically completely independent of stock price.

Another Look at Gizmo and SugarWater

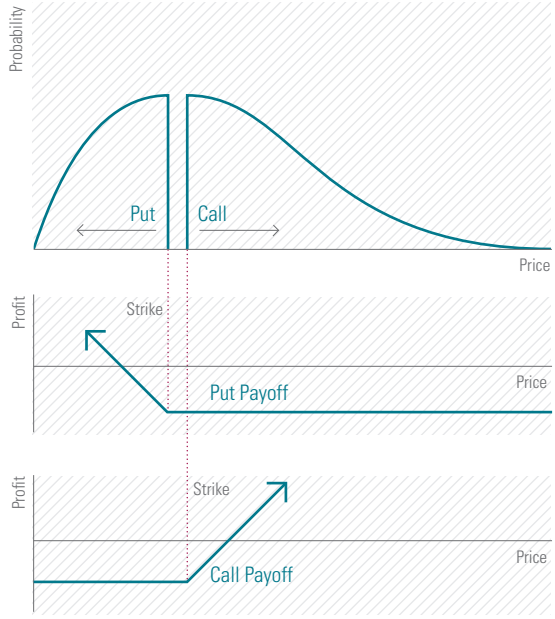
Recall SugarWater and Gizmo. They both have the same expected value. The $50 price for Gizmo is based on an estimated 10% chance of a $500 outcome and a 90% chance that the stock flops and is worth zero. SugarWater is also trading at $50, but it has a 50/50 chance of 0% growth or 3% growth, and the stock would either be worth $45 or $55, respectively. The fair value is the same, but the distributions of possible outcomes are completely different. The two stocks have the same expected value, but the implied volatility of the options on Gizmo should be dramatically higher than the implied volatility of the options on SugarWater. (If they're not, we have an investment opportunity. But I get ahead of myself.)

This is the key to intuitive understanding of option valuation. I think of options investing as buying or selling the upside or downside on a stock relative to a certain strike price. Options allow me to split the probability distribution into upside and downside.

Visualize Uncertainty and Option Values

To visualize how uncertainty translates to option prices, let's split the distribution into its upside and downside graphically to determine the option values:

Probability Distribution Split into Call and Put

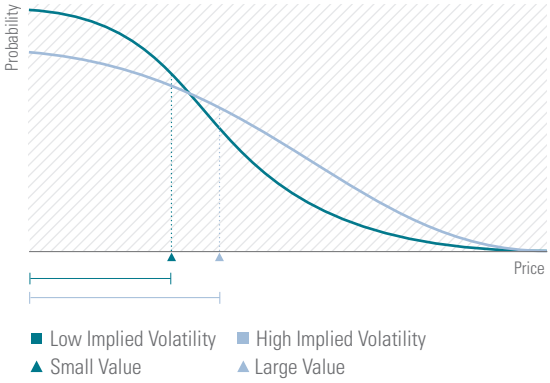


Strike

"Strike" or "strike price" is just a bit of jargon that specifies the price over which the upside is being granted. An option can be "struck" at prices different from the price at which the stock is trading today.

The value of an option is determined by the expected value of the part of the stock price distribution represented by that option. This concept becomes clear when represented graphically: If we balance the upside of the distribution on a knife edge, the distance between the strike price and this balance point is the value of the option. If we compare the upside of the wide probability distribution with the upside of the narrow one, we can see how the wider distribution generates a balance point further from the strike price—it is therefore a more valuable option.

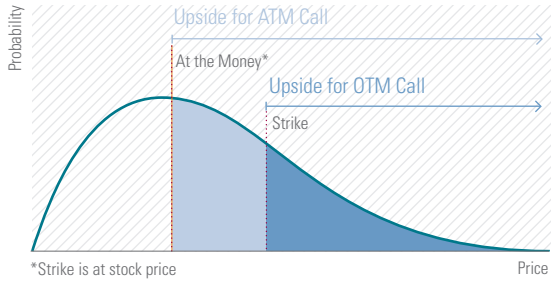
Two Call Options with Different Implied Volatilities



Positions Are Just Wedges of the Probability Distribution

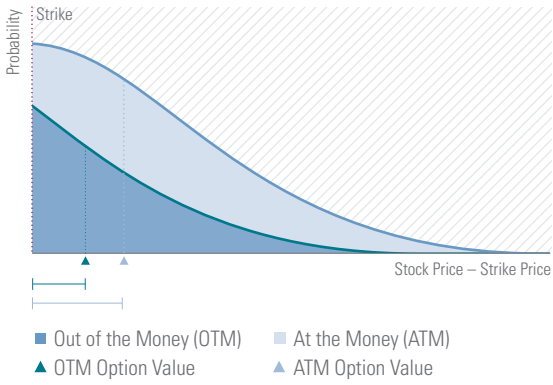
The fact that options can be represented by the upside or the downside from the strike price on a probability distribution comes in particularly handy in visualizing complex option positions and understanding relative probabilities. First, let's examine the relative value of the upside as the strike price of the option moves further above the stock price, called further "out of the money."[3]

Two Call Options with Different Strikes



In the diagram below, we note that the further out of the money the strike price is, the less area there is under the curve. Conversely, the closer to in the money the option is, the greater the area under the curve. The expected value of the option is the balance point of the wedge of the probability curve, so we can see that the further out of the money option's expected value is less than that of the one that is nearer to being in the money.

Graphical Valuation of Two Call Options with Different Strikes

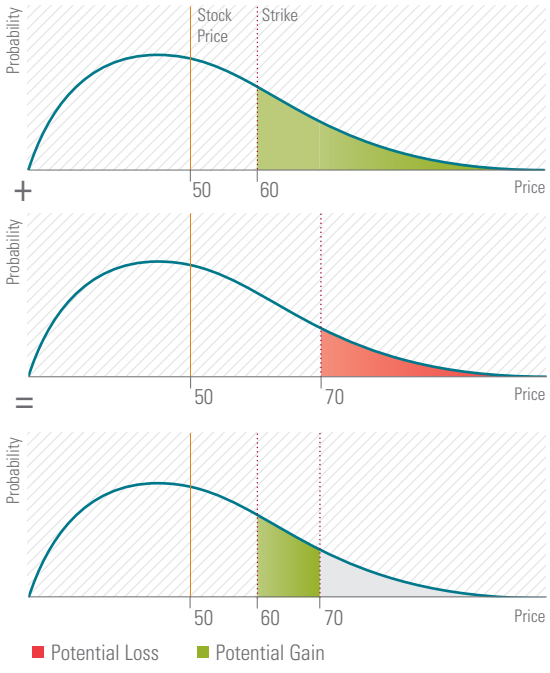


We can create option positions on a given stock with all kinds of payoffs by simply adding together individual option positions. We can also visualize these combined option positions by simply overlaying all of the individual

[3] "Out of the money" (OTM): An option does not have any value if exercised today. For example, a call option to buy a $100 stock for $105 has no value at all (why would anyone want to pay $5 more than something is being traded for in the open market?!), so it's OTM. Similarly, a put option to sell a $50 stock for $45 is equally worthless, so it's OTM.

positions on the same probability distribution. For example, one of the simpler positions using multiple options is called a call spread. A call spread is the combination of two call options, one at a higher strike price than the other. For this position, the maximum profit to a buyer of the spread (or loss to a seller) is the difference between two strikes. So, for example, if shares of ABC are trading at $50, we could buy the upside from $60 and sell the upside from $70 to create a call spread. If we add the two positions together, we are buying the upside between $60 and $70. This can be represented by adding the two graphs below to produce the third.

Graphical Derivation of a Call Spread

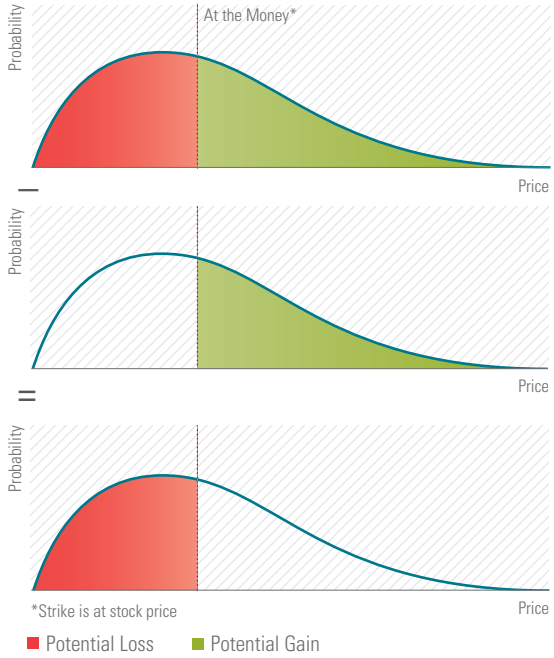


In the graph above, we can see that a call spread is simply buying the upside wedge of the probability distribution between $60 and $70. The value of the call spread is represented by the balance point of the wedge of the distribution relative to the $60 strike price.

Graphical Valuation of a Call Spread

One more example to solidify this concept: Perhaps the best-known option transaction, and the one considered most safe, is the covered call. An at-the-money covered call is executed by simply buying the stock and selling the upside above some price. It is represented on the probability distribution below. The stock is depicted as the whole distribution, red below the current stock price, green above.

Graphical Proof That a Covered Call Equals a Short Put



However, with graphical analysis, we can see that the payoff from a covered call is simply the stock exposure to the upside or downside relative to the strike price, minus the upside exposure above the strike price of the call. When we add these two up, we wind up with the downside exposure relative to the strike price.

Going back to our basics, the downside exposure relative to a strike price is simply a put option. The conclusion: A covered call is effectively the same transaction as writing a put at the same strike price. In fact, if we keep the cash on hand to buy the stock if we need to, it is exactly the same, and any dividends on the stock are reflected in the option pricing.

Distributions Aren't Exactly Log-Normal

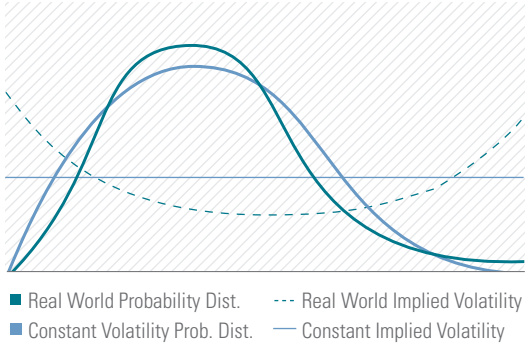
As we've been developing this graphical concept, we've focused on a log-normal distribution. However, this is where the BSM model assumptions begin to fail. The stock price can actually fall on a distribution of any shape. There is no rule in Mr. Market's head that says that the distribution of outcomes for the stock price has to follow a random walk to a log-normal distribution. Therefore, there is no arbitrage between strike prices. In other words, you can't sell options at one strike price, and buy options at another because of different implied volatilities and expect to make money. We can see this when we examine the implied volatility of options across a number of different stock prices.

Implied Volatility of Options

Strike	Ticker	Mid	Implied Volatility	Strike/ Stock
55.00	IBMLV	35.20	92.80	61.00
60.00	IBMLL	30.60	87.20	67.00
65.00	IBMLM	26.00	79.90	73.00
70.00	IBMLN	21.55	73.20	78.00
75.00	IBMLO	17.30	67.20	84.00
80.00	IBMLP	13.40	62.20	89.00
85.00	IBMLQ	9.75	56.50	95.00
90.00	IBMLR	6.70	52.30	101.00
95.00	IBMLS	4.20	48.10	106.00

The implied volatility is not constant across strike prices because the option market does not believe that the distribution of outcomes for the stock price is log-normal. Typically, the implied volatility rises as the strike price moves away from the current stock price, both higher and lower, which means that the options market thinks that big stock price changes are more likely than what is represented by a log-normal distribution. Below is a constant implied volatility curve and associated probability distribution shown as solid line compared with a real-world implied volatility curve as a dashed line.

Comparison of Constant Volatility vs. Real World Volatility



The deviation from log-normality is one of the reasons volatility is useful as a relative measure of price, but not an absolute model.

Principle 6: Decompose Option Price Changes

The return on an option investment is simply the change in price of the option over the time that it is owned. It sounds simple, but understanding the mechanics of option price changes takes a bit of a new mindset. The good news is that it's no more complex than stock investing once you have developed the intuition behind the drivers of option price changes. Building on what we know about statistical pricing, probabilities, and visualization, let's put it all together and see what drives changes in option prices.

The price of an option is determined at any given time by the four factors we discussed when developing the intuition of the BSM model: the relationship of strike to stock price, the time to maturity, the implied volatility, and the interest rate. Therefore, the change in the option price can be simply decomposed into the impact of the change in each one of these variables. Option market makers often think of options in relation to the sensitivity of the option price to the underlying factors in valuation. These sensitivities are called the "Greeks" because they are typically represented by Greek letters: Delta for the sensitivity of the option price to the change in stock price, Vega (which is actually not a Greek letter, but rather an appropriated name of both the star Alpha Lyrae and a poorly made Chevrolet from the 1970s) for the sensitivity to the change in implied volatility, Theta for the sensitivity of the option price to a change in the time to maturity as the contract matures, and Rho for the sensitivity to the change in interest rates.

Using Morningstar's option chains, we can very clearly decompose the change in any option price into the impact of the change in the three elements (changes due to interest rate are typically small, and we lump this impact into "other").

Focusing in on the $85 strike option (a call on IBM) trading at $9.75 in the graph below, we can clearly see that the $1.60 price change in the option today is the combined impact of $1.36 related to stock price change, $0.30 related to implied volatility change, and -$0.06 related to the change in time value.

While the analysis of the daily change in an option price is helpful to understand the framework by which option prices gyrate, it is particularly helpful to investors to understand how an option price evolves over the life of an investment. Let's look at a call option on a stock trading at $100 with a $105 strike expiring in six months selling for $4.50. Since it is a $105 call, it has no exercise value at the time it is purchased (i.e., it is out of the money). Implied volatility associated with

Morningstar Option Chains

Strike	Ticker	Mid	Change	Change (Price)	Change (IV)	Change (Time)	Change (Other)
55.00	IBMLV	35.20	▲ 2.55	▲ 2.13	▲ 0.15	▼ 0.02	▼ 0.06
60.00	IBMLL	30.60	▲ 2.25	▲ 2.05	▲ 0.26	▼ 0.04	▼ 0.02
65.00	IBMLM	26.00	▲ 2.25	▲ 1.98	▲ 0.34	▼ 0.04	▼ 0.03
70.00	IBMLN	21.55	▲ 2.15	▲ 1.88	▲ 0.34	▼ 0.05	▼ 0.02
75.00	IBMLO	17.30	▲ 1.95	▲ 1.75	▲ 0.28	▼ 0.06	▼ 0.02
80.00	IBMLP	13.40	▲ 1.90	▲ 1.58	▲ 0.40	▼ 0.06	▼ 0.02
85.00	IBMLQ	9.75	▲ 1.60	▲ 1.36	▲ 0.30	▼ 0.06	0.00
90.00	IBMLR	6.70	▲ 1.40	▲ 1.11	▲ 0.35	▼ 0.06	0.00
95.00	IBMLS	4.20	▲ 1.10	▲ 0.82	▲ 0.32	▼ 0.05	▲ 0.02

the $4.50 price is 20% and both the implied volatility and the option price combined with the strike-stock ratio indicate something about the probability the stock price will climb over the strike, and by how far.

As the amount of time to expiration grows shorter, the original time value shrinks with it. All other factors like stock price and volatility held equal, this "time decay" feature would lower the value of the option a little bit for every day that passes.

Let's assume the stock price climbs over $105 to $106. At this point, the option is in the money so has "intrinsic value" (i.e., you have the right to buy a $106 stock for $105 which, by itself, is worth $1). Even though the stock price has climbed above the strike price, as long as the option has not expired, there is still the chance that the stock will go higher, so the option will be valued at something greater than the $1 of intrinsic value.

Let's assume that, at expiration, the stock is trading at $110.45. There is no more time left on the option, so time value goes to zero. Also, there is no more uncertainty about what price the stock price will be at expiration (since the contract has expired, we know exactly what the stock price is), and without uncertainty, there is no implied volatility. The only portion of value that remains for the option is the relationship of the ending stock price to the strike. A simple calculation shows us that the value of the option will be:
$110.45 – $105.00 = $5.45

Originally, you paid $4.50 for the option and six months later you have something worth $5.45. This means you made $0.95 on an investment of $4.50 for a semiannual return of 21.1% and an annualized return of roughly twice that, or 42.2%.

Effect of New Information on Option Prices

Options, like all investments, are forward-looking, and they react to changes in investor expectations. This is another case where it is worth reiterating a concept: option prices change in response to changes in expectations. Any new information that changes expectations about the expected stock price or the range of outcomes for the stock price "should" change the price of the options on the stock. Should is the operative word here. In fact, if the options market is using statistical volatility as an anchor for options pricing, we'd expect cases where the options market does not react appropriately, and that presents opportunity for us.

Simplistically, any news or information that increases the expected value of the stock should immediately move the stock price. This news can be a company release, economic data, earnings reports from a competitor, news reports of product scares, etc. Likewise, if these data change the uncertainty about the range of outcomes around the expected stock price, it should also change the value of the options. Ultimately, it is the combined impact of the information on both the underlying stock price and the uncertainty around the stock price that drive the changes in option prices.

To people new to the options world, some of the price reactions can seem confusing or counterintuitive at first. However, using what we have learned about the inputs into option prices, we will see that these changes are sensible and easily understandable through the following examples.

Big Announcements

Imagine you find a great story stock. The rumor is that this company is going to be issuing a brand new product on the 20th of the month, so on the 19th, you load up on out-of-the-money call options hoping to take advantage of a strong price appreciation upon the

formal product announcement. On the 19th, the stock is trading at $45 and you buy your options struck at $50, paying $3.69 for them. After the market closes on the 19th, the CEO goes on stage in California to introduce the category killer: a beautiful new mobile phone that is sleek, sexy, and functional. The press and analysts, normally very hard to please, are singing the device's praises and the stock rises 5% in after hours trading. What a smart investment, you congratulate yourself—you'll be able to sell the option tomorrow for much more than you paid for it, or simply wait a while and let the stock price exceed the strike and really rake it in! Imagine your surprise when you check your prices the next morning and find that the contracts you bought for $3.69 the day before are trading for only $1.50. What the heck happened?!

To understand this, we must go back to the concept of volatility. In this case, the entire market expects some announcement to be made on a certain date, so investors begin buying options to grant them either downside or upside exposure (or both) depending on what they think the outcome will be. Volatility is the commodity and it is in very high demand; as a result, its value rises. In our example, I have assumed implied volatilities reach 60% on the 19th. As soon as the product announcement is made, the mystery is gone and, because the range of outcomes for the stock price after the announcement becomes much less uncertain, the implied volatility suddenly declines. In our example, I have assumed implied volatility falls to an annualized rate of 25% on the 20th. Even though the price of the stock rises to become closer to the strike, this effect is swamped by the enormous drop in implied volatility. The option's value drops nearly 60% overnight.

Holiday Weekend "News"

It is March 20, 2008—the day before the Good Friday holiday. Yesterday, you bought a call on XYZ stock expiring at the end of March struck at $13 for $0.18 when the stock was trading at $12.75 per share. You had expected some good news that would boost the stock up above $13, but if the stock didn't move, you could sell the call back before it expired. When trading starts on March 20, your call is priced at $0.17, but as you check your screen through the day, you realize that the value of your option is very quickly dropping. By the end of the day, it is priced at $0.13—a loss of 24% in one day. You cannot believe your eyes! Implied volatility has stayed constant at an annual rate of 30% and the stock has actually moved up a few pennies from yesterday's close. What the heck happened?!

As the clock ticks away over the weekend, if the stock has not moved, the probability that the stock will make it past the strike in the time allotted becomes smaller and smaller (so the bet becomes worth less and less). In a similar way, as an option nears expiration, all other things held equal, there is less and less of a probability that it will increase in value and wind up in the money. Near-the-money options lose their time value very quickly in the last few days before the contract expires. In this case, there are only 11 days before the stock will expire and over the holiday weekend, three of those days will be burned up. The market begins pricing the options as if the holiday has already happened—like rust, time decay never sleeps.

In contrast to this example, the loss of time value for extremely long-dated options (LEAPs) with most of the contract time still in the future is almost completely negligible. A two-year LEAP struck at $13 when the stock is trading at $12.75 is worth around $2.68. Three days later, it is worth $2.67—a decrease of only 0.4%.

Principle 7: Compare Option Values with Prices

Legendary value investor Benjamin Graham, the mentor of Warren Buffett, in his book "The Intelligent Investor" describes a character "Mr. Market" who shows up on an investor's doorstep offering a different price for a stock each day. The prices Mr. Market delivers vary from reasonable to ridiculous. Graham describes investing as a simple exercise: One waits for Mr. Market to show up with a ridiculously low price before buying and likewise waits for a ridiculously high price before selling. However, only by doing the fundamental research to understand the "intrinsic value" for the stock is one able to pursue this strategy.

The key message that we can take away from Graham's allegory of Mr. Market is deceptively simple and applies to all forms of value investing: One needs to understand what an investment is worth, and then pay less than the investment is worth or sell for more than the investment is worth.

To better understand the options market, we'll extend Graham's allegory by adding an additional character, and in the interest of gender neutrality, we'll name her Ms. Volatility.

Imagine the options couple, Mr. Market and Ms. Volatility, arriving at your doorstep every day, discussing not only the stock price, but also the ranges of stock price outcomes in the future.

By superimposing Ms. Volatility's indecisions about the range of outcomes for a stock on Mr. Market's mood about the stock price itself, you will get served up many option prices associated with the range of potential outcomes for the stock at different times in the future. The interchange would go something like this:

Mr. Market: MegaCorp shares are worth $28.58 per share today, down $1.00.

Ms. Volatility: Well, since the stock price is down 3.5% today, I'm scared, so the implied volatility is 38%, up 5 percentage points. (Typically, Ms. Volatility increases her indecision about the stock price as the stock price declines.)

From this exchange, we can see that having a good, fundamentally driven handle on the potential outcomes for the long-term value of the company can provide for interesting investing opportunities. Let's say the options couple will pay you $3 if you agree to buy the stock at $25 over the next year. The couple is nervous and wants to protect itself from further declines in the stock.

If you think MegaCorp may face some short-term impacts to earnings, but it has a long-term value of over $40, then getting paid $3 for agreeing to buy the stock at $25 is a pretty good deal, giving you a cost basis of $22 ($25 – $3) on a stock you think is worth $40. The fact that Ms. Volatility gets nervous and raises what she's willing to pay when Mr. Market's mood drops the stock price should now seem even more absurd. The cheaper the stock relative to intrinsic value, the cheaper the options should be.

Even if you think the range of values for MegaCorp could range from $30 to $50, that $22 cost basis is a screaming deal. And, if you don't wind up owning MegaCorp, by comparing the $3 insurance premium with the $22 capital at risk, you realize that you are earning a respectable 13.6% return on your capital at risk. Because our imaginary couple is jittery, the option is priced as if uncertainty is much higher than it really is. Uncertainty is overvalued.

The Morningstar Option Strategy Map

We can summarize our three potential conclusions about the underlying stock as follows:

- Overvalued Stock = Bearish
- Fairly Valued Stock = Neutral
- Undervalued Stock = Bullish

Similarly, we can summarize our three potential conclusions about the uncertainty:

- Overvalued Uncertainty = Sell Options
- Fairly Valued Uncertainty = Neutral
- Undervalued Uncertainty = Buy Options

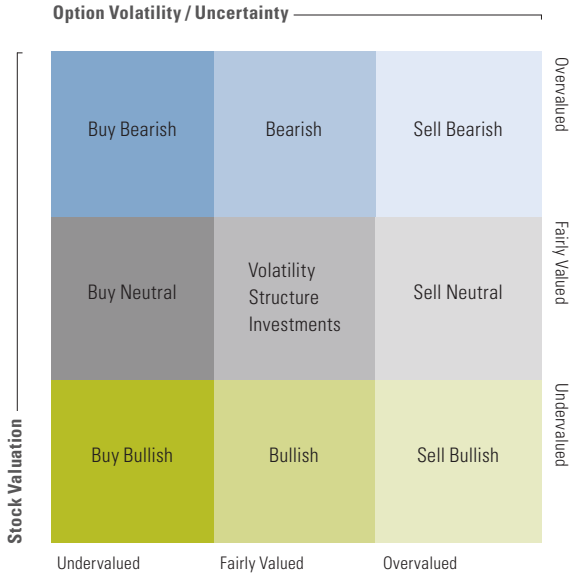
If we put the stock valuation dimension on the vertical side of a table and the option volatility valuation dimension on the horizontal side, we can fill in the grid with the potential option investment strategies, creating the Morningstar Option Strategy Map.

There can be more complexities and subtleties to investing in options, but the valuation of the stock and the valuation of volatility are the big hitters to get started evaluating an option's investment opportunity. How does one value uncertainty? I'll admit it's not simple. Morningstar's uncertainty rating around a company's fair value attempts to rank the relative uncertainty of companies. You can think of the uncertainty rating as a rough guideline for the long-term valuation of uncertainty. Doing it yourself, the simple question you need to ask yourself is, "How tightly can I bound my long-term fair value estimate for this company?" The more tightly you can bound the answer, the less the uncertainty and the lower the fair value of the implied volatility for the options.

Visualizing Opportunity on the Probability Distribution

We have discussed how the market is implicitly anchoring its expectations on the present market price for the stock and assuming that the stock will move

Morningstar Option Strategy Map



Potential Option Investment Strategies

Buy Bearish	Bearish	Sell Bearish
Put	Sell Stock	Call
Put Spread	Short Stock	Call Spreads
Put Backspreads	Short Combo	Call Backspreads
Split Strike Combo	Split Strike Combo	Split Strike Combo
Protective put		Covered Call

Buy Neutral	Volatility Structure Investments	Sell Neutral
Collars	Time Spreads	Straddles
Straddles	Combos	Strangles
Strangles	Complex, Multi-Strike	Butterfly
Butterfly		Condor
Condor		Call Buy/Write
Ratio Spreads		Ratio Spreads

Buy Bullish	Bullish	Sell Bullish
Call	Buy Stock	Put
Call Spread	Long Combo	Put Spreads
Split Strike Combo	Split Strike Combo	Call Backspreads
Call Backspread		Split Strike Combo
Protective Put		

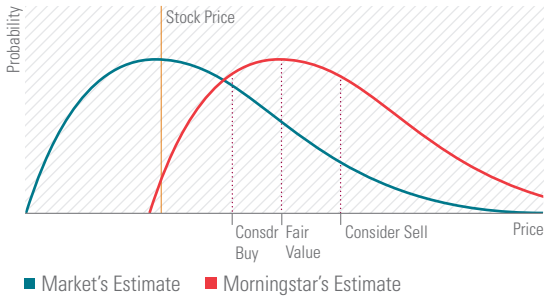
randomly from then on according to the BSM model. In contrast, I prefer to use a wide range of fundamental information about a company to understand the range of potential values for the stock price. I then estimate the expected value of these outcomes and call it the "fair value estimate," and I look at the range of potential outcomes to estimate the uncertainty around the fair value estimate.

The difference between Mr. Market's price and our estimate can become an investment opportunity in a couple of ways. As we discussed in the strategy map, we can compare the implied volatility with the uncertainty to see if we should be selling or buying options, or we can compare the underlying stock value with the market price, or both.

However, as fundamental option investors, we should remember that implied volatility is a handy tool for comparing the price of one option to another, but we can go one better to determine the value of an option. At the greatest level of sophistication, we can compare our predicted range of outcomes for the stock price with the range of outcomes predicted by the option market prices and look for the greatest disparity to find the greatest investment opportunity.

Using our probability distribution as a guide, we can compare the probability distribution implied by the options market to the range of values we think is probable for the stock.

Implied Probability Distribution Compared with Fundamental Valuation



We can see that, in this case, the values that we think are likely for the company are considered extremely unlikely by the options market. Therein lies the opportunity, either to buy cheap out-of-the-money calls, or sell overvalued puts. To decide which, we can compare the value of the option to the market price (as well as consistency, or risk tolerance). Graphically, this is done by comparing the center of gravity of the option with the range of fundamental valuations.

Principle 8: Execute Strategies Efficiently

There are some tactical issues with using options. Transaction costs have been steadily falling, but they are still murderous. Taxes can be complex, and index options require special treatment, but there are also opportunities for tax-aware investment strategies using equity options. I think the benefits of investing through options more than offset these concerns, but careful attention must be paid to execution.

Transaction Costs Can Kill You

Transaction costs can deplete an investment account faster than you can say "Black-Scholes." Transaction costs include the spread between the price at which you can buy a security and the price at which you can sell it, or the "bid-ask spread," the impact that your trade can make on the market price to get filled for large orders, and commissions. Option market bid-ask spreads are dramatically higher than for stocks, trading commissions are typically much higher, especially for large orders, and there is less "liquidity" to get large orders done in the options market at close to the market price. There also may be other miscellaneous fees for trading inactivity and other annoying administrative costs. To minimize these costs, it is important to understand the reasons for the high costs and know a few techniques to overcome them.

Understand How the Options Market Works—Market Basics

Options, like stocks listed on Nasdaq, are considered "over-the-counter" products. That means that a dealer on a trading desk at an investment bank has agreed to "make a market" in option contracts for certain stocks. "Making a market" simply means that the dealer agrees not to turn anyone away from trading in that security. The market makers must post their prices publicly and transact at the prices listed.

Another characteristic unique to options is that market makers don't want exposure to the underlying stocks. Most hedge using the Black-Scholes model, selling stock short to offset put positions and buying stock to offset call positions, and most continually adjust stock positions to keep the correct "hedge" to options ownership. Now, imagine if you were making a market in the options of hundreds of stocks, all of which had several potentially market-moving news stories coming out about them at any one time. It's not hard to imagine that one would start to worry that the people wanting to trade with you might have an informational edge.

As a result, the dealers offer to buy at one price (the bid) and sell at another (the ask or offer)—the so-called bid-ask spread, on which they make their profit. The more volatile and illiquid a stock, the greater chance of "gapping" up or down (wherein the stock price opens a trading session at a significantly different price than it closed the previous session), the more difficult to hedge, the wider the bid-ask spread.[4]

As with a car dealership, where you can spend $20,000 to buy a new car, drive it around the block once, and find that the dealer will offer to buy it back for only $13,000, options dealers want to make sure that if you test drive one of their options for a few days, they will realize a very healthy profit on the "round-trip" trade when you sell it back to them.

Patience Is Key in Option Transactions

One way to reduce the impact of the bid-ask spread is to recognize that the prices are the beginning points for negotiation. You can imagine the midpoint between the bid and asked price for the option as the value of the option, and any difference between the midpoint and the bid as the market maker's "market."

[4] Considering the difference between the bid price and the ask price and how important volatility is in option pricing, it will come as little surprise that traders talk about "bid vols" and "ask vols" and that these volatility levels can be very different.

The way to negotiate with a market maker is to enter what is called a "limit order," which is a price at which you are willing to buy or sell the option. You can enter that price and leave it in the market, and the market maker may or may not execute the transaction. The transaction could be executed immediately, or at some time later in the day, so patience is key.

For example, if an option is Bid $1.00 and Ask $2.00, the midpoint price is $1.50. The $1.00 the market maker is willing to pay you has a $0.50 profit baked into it, as does the $2.00 price the market maker wants you to pay for the option. If you enter a price that you are willing to pay of $1.70, you are offering a price that will cut the market maker's profit off of selling you the option from $0.50 to $0.20 if the market maker executes the transaction:
$2.00 – $1.70 = $0.30

This is known as trading $0.30 "inside their market."

However, if the price for the stock takes a large swing while your limit order is in place, you could wind up getting "filled on your order" at the price you want for the option, but at an implied volatility that is significantly in the market maker's advantage. The resting limit order effect can be counteracted using a "fill or kill" limit order, which gives the market maker one shot at your order. There are more details to execution, but the point is to pay attention to execution.

A Long-Term Focus Helps

Just as in stock investing, I believe there is an advantage to conserving capital, planning one's investment strategy carefully, and making each trade count. Trading multiple times a day, making frequent round-trip trades at the broker, and trying to scalp the bid-ask spread when you're not an option market maker are good ways to put your broker's children through college at your own kids' expense!

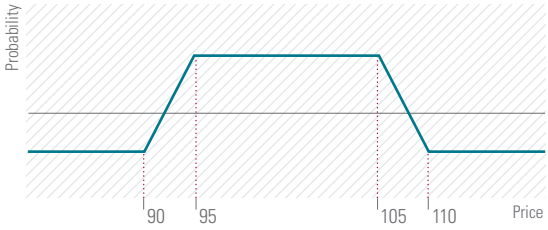
If you purchase or sell options and hold them to expiration, you can at least save half of the bid-ask spread, because you buy or sell only once, and you get the value of the options at expiration.

Principle 9: Learn the Language

We think investing in options is a pretty simple thing, but I realize that it often seems almost impossibly complex because of the jargon used. This part of our guide is designed to give you an idea of what the jargon means and how to reduce all of the jargon to a simplified framework. The option strategy map should help translate all of those crazy option strategy terms. The probability distribution should help you collapse those strategies to an intuitive graphic of buying or selling wedges of the probability distribution.

Let's take a look at one particularly colorfully named strategy and see if we can make sense of it within the structure of Morningstar's Option Strategy Map.

The Iron Condor

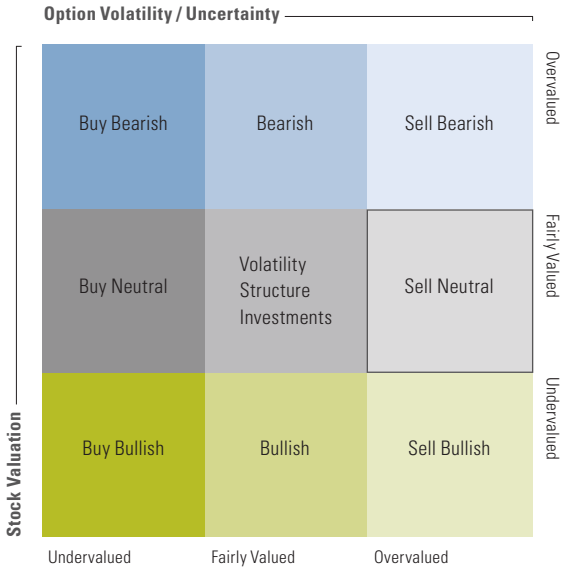


No, this is not the villain from a Wild West fantasy movie, it is the name of a very interesting and attractive options strategy, especially in environments when volatility is overvalued and the stocks are fairly valued.[5] As you can see from the payoff diagram below, the iron condor is a combination of four puts or calls at different strike prices. It may take a minute to work through the logic of the final payoff diagram, but if you trace carefully, you will see that the resultant payoff diagram looks like a hat with sloped sides and the opening pointing downward.

What this shape tells us is that 1) we are short volatility (i.e., a net seller of options) and 2) as long as the underlying stock price does not move past the $95 or $105 levels, we get to keep the entire premium we received when we first entered into the trade.

In economic terms, the fact that we are short volatility shows that we think volatility is relatively expensive (i.e., the outcome is more certain to us than to the market). Also, the fact that we have set up the position such that the stock price can move around somewhat before we start to eat into the cash flow from our option premiums means that we recognize that the present stock price is about right, but there may be some short-term swings from which we want a bit of cushion.

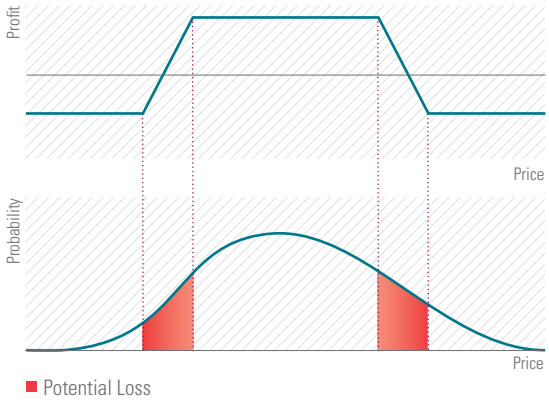
Using the Morningstar Option Strategy Map, we can envision a situation where we see high volatilities (moving toward the right side of the graph) and relatively correct values for the given stock (near the middle of the chart), and we wind up in the sector marked "Sell Neutral."



[5] This is also called a "short condor" by some.

Now, let's take a look at this from a probabilistic standpoint by overlaying the payoff diagram on the probability distribution.

Iron Condor Compared with Probability Distribution



Here we can see the probabilistic bets the seller of an iron condor is making: maximum profits for the most likely region of the curve and gradual degradation of those profits if the stock moves too far from its present market price. Notice also that the iron condor caps our losses at a certain point, so while we are selling options "naked," our losses are limited.

Principle 10: Manage Your Psychology with Your Portfolio

When it comes to investing, nothing beats discipline and careful risk management. This is especially true when investing in options, because they offer a huge amount of potential leverage (i.e., one can buy the right to a large portfolio with a comparatively small initial cash outlay). Leverage means that both risks and rewards are amplified, so the unprepared often find themselves surprised and disappointed when the market turns against them. Here are a few simple rules to lay the groundwork necessary to prudently build wealth using options.

❶ Options are investments, not trades.
The only people who get rich in day trading are the brokers receiving the commissions and market makers profiting from the bid-ask spread. I believe that one of the keys to success is to view options as investments. An investment means finding a situation where, for some reason, the expected value has been mispriced by the marketplace, then waiting to allow the market to prove you right. This can be emotionally painful at times. Consider your state of mind when a far out-of-the-money put you wrote is suddenly exercised, leaving you with a position in the underlying stock. If you have done your homework and have calculated that an investment in this company will generate adequate returns at the entry price you chose, the exercise of that put allows you to buy a stock that fits all these criteria. Some may frame the situation of an exercised put as a loss—but for smart, prepared investors, having a put exercised is buying a security you want at a great price relative to its intrinsic value.

❷ View options from a portfolio perspective.
Investing "perfectly" is impossible. I believe that one should strive to take the time to construct a portfolio of investments that 1) are truly independent from one another (in terms of market capitalization, economic drivers, end markets, and the like), 2) can each reasonably be expected to generate enough profit to compensate one adequately for putting one's capital at risk, 3) are numerous enough to be diversified, but not so numerous as to dilute the effect when one is a home run (10 to 15 positions is usually the right ballpark for stocks, although it could be more, depending on other risk factors), and 4) are sized according to the "edge" you have over the market (the so-called "Kelly criterion"). If you are buying way out-of-the-money leaps, you are naturally more likely to have a lot of misses, so you need to spread your bets more widely.

❸ Get used to thinking of batting averages and expected values.
Batting averages represent the percentage of wins (i.e., positive returns) over our three-year investment horizon. Expected value is the average return across all your bets over this time; it is determined by our fundamental estimates of the future value of the stock when compared with the present market price. Combining the concepts of batting averages and expected values with our guidelines for portfolio management, we can develop a strategy for generating positive returns by aiming to achieve as high a batting average as possible, with as high an expected value for each win, while limiting losses on the rest of our bets. By doing this, we start concentrating more on generating a consistent stream of high-probability wins than on knocking each ball out of the park. This concept ties in directly with the psychology of managing your portfolio. You cannot look at, evaluate, and become emotionally involved with each investment between initiation and the expiration of the investment. The only way to run a successful portfolio is to keep your eye on the aggregate return of the portfolio, the investment process used to generate the portfolio, and the aggregate outcomes over time.

For an example of what can happen to challenge your psychological discipline, refer to Appendix 4—My Option Isn't Worth *That* Much!

❹ Let time work for you.

Most market participants seem to operate on an investment horizon of a few quarters. But short-term investing places speculators at a natural disadvantage for the following reasons:

Market Drift. Stocks have a drift component that results from the earnings that they generate over time but that speculators never see due to their quick ins and outs. This means that bullish strategies will win over bearish ones on average and in the long run. This doesn't mean that a bearish investment is never viable; it simply means that one's overall investment strategy will likely benefit from remaining bullish.

Fair Value Convergence. If a stock is undervalued, it rarely jumps immediately to its intrinsic value. I refer to a willingness to invest in a longer horizon than these factors as "time horizon arbitrage." The convergence to fair value takes time. What is a reasonable amount of time to set as an investment horizon? I believe that three years is usually enough for a stock to move to its intrinsic value, and leap options are now available to get close to this horizon. Why three years? Historically, economic downturns rarely last more than three years. Also, most business turnarounds, mergers, and acquisitions can be completed and benefits realized in this time. Last, most investment fads and speculative bubbles have a tough time lasting longer than three years.

Trading Costs. More trades in any given time frame means more trading costs to be overcome. Enough said.

Capturing the Time Horizon. Option investors can take advantage of the drift of the stock market just like stock investors can by using long-dated options. These long-dated options, called LEAPs, allow investors with a longer investment horizon to capture the drift, and they also allow time for the stocks to rise to their intrinsic value. Plus, buying long-term options is typically cheaper on an annualized basis than repeatedly buying short-term options because implied volatility tends to be higher in the short term.

Capturing Time Decay. The value of short-term options decays much more rapidly than the value of longer-term options. This means that, for a given value of exposure, you earn a greater return repeatedly selling short-term options than selling one long-term option. By selling relatively shorter-term options, your annualized return will be much greater over time. However, with shorter-term options there isn't as much of a dollar cushion from the stock and trading costs will be higher.

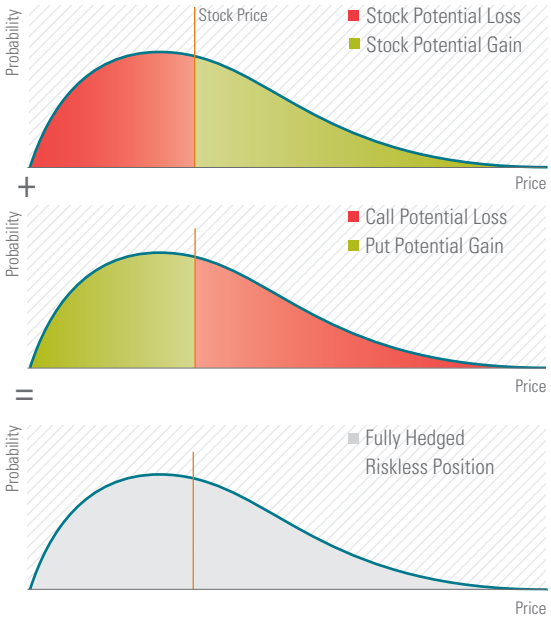
Putting It Together. To make time work for you, have a long-term investing horizon. Have a long bias to capture market drift, buy longer-term options that allow time for the stock price to converge to fair value, and sell shorter-term options to capture the benefits of theta. A portfolio like this would be described by market experts as "a long bias" and "long the term structure of volatility"—which just means buying longer-term options and selling shorter-term options.

❺ Understand the impact of net option exposure on your portfolio.

Let's solidify these concepts using an example portfolio. If we put 100% of a stock portfolio in a market index fund, we have a broad range of outcomes in the short term. We can bound those outcomes by selling the upside and using the

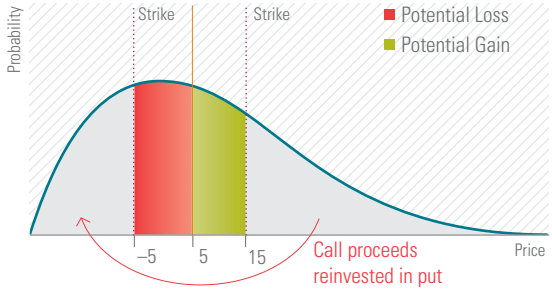
proceeds to buy protection from the downside. Let's say that bounding the outcomes down to zero risk generates the Treasury rate of return (5%, let's say) over the duration of the option. This 5% return is shown on the probability distribution of out-comes for the index. Now, if we're willing to accept more risk, we can relax those bounds, selling the upside above, say, a 15% return over the next year and using the proceeds to buy downside protection against a decline of more than 5%.

Fully Hedged "Riskless" Index Position



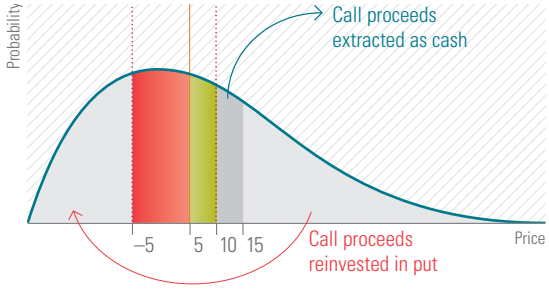
As we can see, we've accepted some risk highlighted in red, no more than 10% downside relative to Treasury rate, in exchange for the chance for an additional 10% upside above the Treasury rate, highlighted in green.

Index Position with Bounded Risk



Further, by narrowing this band relative to today's price, we can generate some cash today in exchange for accepting more risk or giving up upside. For example, we could sell the upside above a 10% return, pay for our downside protection below a 5% drop, and keep the remaining proceeds from the sale of the upside and generate a few percentage points of cash flow today. We've traded a portion of the upside for cash. We can see in the diagram below that we're selling a little wedge of our upside for cash today.

Index Position with Bounded Risk and Harvested Cash



6 Unlimited losses should scare you.
Unlimited losses are no fun. Stay away from writing naked calls. Even if you are right in the long run, if the stock swings against you in the short run, a margin call can easily wipe you out. Investment returns are the product of a number of investment portfolio returns over shorter time periods, multiplied together. Put one zero in that string, and the ending portfolio value is zero.

Appendix 1

90% of Our Trades Make Money—And Other Expensive Half-Truths

On my desk is a stack of marketing pitches I've received over the past year hawking option investing classes, strategies, and systems. These advertisements range from the relatively benign to the borderline criminal, but the key thing to keep in mind is that the objective of the guys making these pitches is to sell courses, newsletters, or systems. That means that the sale needs to be simple and emotionally appealing, but it does not necessarily mean that the system will make you money.

I'll walk through a few of these pitches in an attempt to prevent you and your money from parting prematurely.

"90% of our trades make money…"

This is my personal favorite, and it preys on the typical neophyte option user's ignorance of statistics. Anyone can come up with a strategy in seconds where 90% of the trades make money, but the unspoken second half of this sentence is, "…and on the other 10% of trades, you lose your shirt."

There is probably a bunch of fancy option lingo and complexity wrapped around the strategy to disguise the simplicity of this fact, but the bottom line is that any strategy where 90% of the trades make money includes big losses on the other 10% of the trades, and those bring your total return down dramatically. I'll be writing quite a bit about option statistics, but the simple version of the "90% of our trades make money" strategy is to write far-out-of-the-money naked calls. Easily 90% of them will make money if they're far enough out of the money, but a loss on any one of the remaining 10% could bankrupt you.

"We bought xxx calls and made 182%," or "We bought yyy puts and made 367%," etc., etc.

Assuming that these "investments" were even made up-front and not generated by picking the winners after the fact, these are just emotionally gripping numbers that were chosen by selecting from among the winners. What isn't being said is that in the same set of investments, "Our xyz calls expired worthless, losing us 100% of our investment," and "Our pdq puts expired worthless, losing us 100% of our investment." To really evaluate an investment strategy, you need to examine a portfolio return over time.

While we're on the topic of emotionally gripping, let's address this one:

"Joe Schmo was living on the street in a box, but he made $100,000 last year with our secret option strategy." This is just like a casino ad showing the smiling face of a big jackpot winner: "Ed Superlucky won $7,200,000 at the Loseyourshirt casino." In this case, you're hearing from the winner, not the 9,000 other casino "customers" who lost an average of $1,000 a piece. To illustrate further, imagine giving 1,000 vagrants each a credit card with a $1,000 cash advance, and having them all make a 100-to-1 bet at a casino. Ten of them will make $99,000 from nothing, and the rest will wind up defaulting on $1,000 in debt. Joe Schmo, who was living on the street in a box, is the options equivalent of one of those 10 winners.

"Our list of recommended trades last year averaged an 82% return."

These near-lies work in a couple of ways. First, there is the fine-print version, where you'll find something like: "This trading performance assumes that

each trade was exited at the high trading price during the period." Think that through for a second. If I bought something, figure I sold it at the same price I paid for it if it goes down in price (the high trading price during the period), and figure I sold it at the highest price it reached if it goes up, of course my calculations will show a huge return!

The second version of the near-lie is slightly more insidious, and it depends on the fact that many options are still relatively illiquid (rarely traded, so a big purchase will move the price of the options). If an options service buys relatively illiquid options, and then pitches the trade to thousands of people, the demand generated will push the price in the service's favor, at which point it will typically sell. The service's portfolio may well make money, but the individual options investors probably won't because they overpaid for the options. When this is done with penny stocks via pitches in e-mails or faxes, it is a little more obvious, and it is rightfully called "pump and dump."

"We've found back-tested strategies that have returned 376% annually, and you can, too, using our back-testing tools."

Back-testing is also called data mining, and it's another way to scam with statistics. In any large set of data, one can statistically find patterns that worked historically, but with no reliable reason the same strategy will work in the future. For example, the Super Bowl Indicator says that most years after the NFC wins are good years for stocks, and most years after the AFC wins are bad years for stocks. The technical term is spurious correlation, and blindly using back-tested strategies should provide a solid, and expensive, education on how schemes that may have worked in the past don't necessarily work in the future.

"Our charting strategy generates signals that blah blah blah… Fibonacci retracement blah blah blah… Candlestick charts blah blah blah…"

Find me one "technical analyst," as they call themselves, among the 500 richest people in the world, and I'll quit my job and read every book ever written on technical analysis.

"XYZ Corp. just got FDA approval for the cure to cancer. We recommend buying the calls on XYZ at…"

Some services seem to add credibility to their analysis by coupling the official release of positive facts with recommendations. This is another strategy for selling services that prey on human psychology. People tend to infer causality when there is none stated. In this case, the sentence adds no value from an investing perspective for two reasons. First, any obvious public news should already have caused the price of the stock and the options to move. Second, even if the news wasn't public, there is no explicit link between the statement and the recommendation. What this service is likely doing is simply linking a news feed to a random generator that suggests the option purchase, knowing full well that human nature will cause many unsuspecting and trusting investors to fall for this strategy and pay money for the worthless service.

"If you wrote options following our strategy over the past five years, you would have made an average of 22% return on your account."

This is the momentum element of options investing, and the one claim that comes close to an undistorted truth. The securities markets have been in a prolonged period of falling volatility. Another way of putting this is that stock prices have been wiggling around less and less each year since 2001. Because of this, writing options has been a winning game over buying options (technically speaking, realized volatility has been less than implied volatility). Will this continue? Not likely. Volatility has been at historic lows, and the world rarely remains a stable place forever. The one sure thing we know is that volatility won't go to zero. Continuing to blindly follow the strategy of mindlessly writing options is a bit akin to buying tech stocks in 2000. The trend will probably eventually blow up in your face, but you don't know exactly when.

Hopefully these examples will help you better evaluate the marketing materials that show up in your mailboxes and let you save that money for real investing.

Appendix 2
Black-Scholes-Merton Model—Or Our Drunken Friend

The intuition of the "random walk" is usually explained using the analogy of a stumbling drunk. Each time the drunk steps, it is in a random direction—sometimes forward, sometimes backward, and sometimes side-ways, and the size of his steps vary as he staggers. On average, the drunk goes nowhere, but he typically winds up somewhere different from where he started. A one-day stock price chart for a high-volume stock resembles the progress of the drunk, you'll see the price move up a by a penny one tick, down three pennies the next, sideways the next tick, and so on. The longer the drunk's average step, the more uncertain his final location. In the investing world, taking large steps equates to stocks that make large percentage moves. Stocks that move a great deal are said to have high volatility.

Now, suppose that we are standing across the street from the drunk. Our drunk friend is standing on a sidewalk, leaning up against a brick wall. As the drunk takes his first step away from the wall, we decide, in a bout of good-natured cruelty, to bet how far away from the wall our drunken friend will end up in 10 minutes.

Because the wall is on one side of the street, he can only move away from the wall, and the closer he gets to the wall, the shorter his steps must neces-sarily become. Clearly, in a given period of time, the distance our friend travels from the wall will be a function of the size of his average step.

If we assume that the length of our friend's footsteps follow a bell curve (e.g., most of our friend's steps converge on a central length, but some will be wider and some will be narrower), statisticians are able to show that our friend's end position after the 10 minutes follows what is called a log-normal distribu-tion. (We'll develop the concept of a probability distribution shortly.)

Imagine that the brick wall to one side of our friend represents a value of $0 per share for a stock. Just as our friend cannot walk any further than the brick wall, a stock's price cannot fall below $0. However, if our friend can string a series of forward steps together, there is theoretically no limit to how far he can walk. In investment terms, this equates to stocks having unlimited upside.

Like friends making bets on a drunken friend's progress away from a wall based on how much he stumbles, the Black-Scholes model (BSM) uses data about the variability of stock price moves and the length of time before an option's expiration to predict how much, on average, the stock price will diverge from the strike price.

The big weakness in the BSM framework from Morningstar's perspective is the assumption that every-one walking down the street is a drunk. In other words, the BSM model assumes that stock prices perfectly reflect intrinsic value, and so they are simply pushed about by random factors. Or, to put it another way, we know which of our friends are drunks and which have homes on the other side of the street (so are motivated to get there).

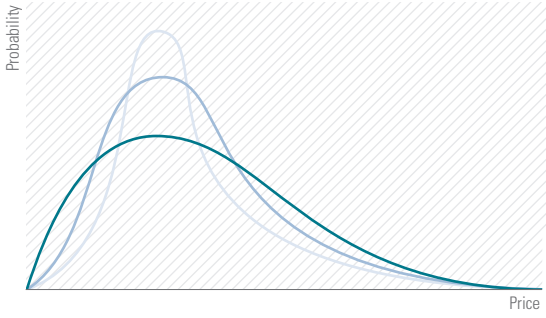
Appendix 3
Implied Versus Realized Volatility

Let's return to our graphical interpretation one more time to understand how implied volatility compares with realized volatility, and thereby how implied volatility turns into cash flow.

The longer the time period, the further the stock can be expected to move away from its current price.

As an option has a longer time period to expiration, the probability distribution gets fatter, and, therefore, the upside or downside becomes more valuable, just as we discussed above for increased implied volatility. Reversing that logic, if time passes and the stock price doesn't move, the option value falls because it has less time to expiration and less time for the stock to move. This decay is depicted below:

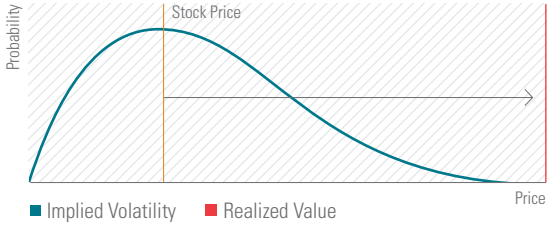
The Effect of Time Decay on a Probability Distribution



The movement of the stock is realized volatility. So, if we sell options and the stock price doesn't move and the option price falls, we realize income because implied volatility exceeded realized volatility.

We can see that large stock movements in either direction by expiration would mean the options were undervalued, or realized volatility exceeded implied. In the figure below, the difference between the stock price at expiration and the strike price is far above the value of the option at the beginning of the time period. If the stock price moves by expiration by more than the option price at the beginning of the time period, we can say that realized volatility exceeds implied volatility.

Implied vs. Realized Volatility



It is also possible to sell and buy combinations of options on a continuous basis as the stock price moves to capture as much of the volatility difference between implied and realized volatility as possible, but understanding the concept of implied versus realized is sufficient.

The point is, implied versus realized volatility is the measure of returns to options, and unlike stock prices, volatility cannot rise indefinitely or stock prices would all swing between zero and infinity. Similarly, volatility could never fall to zero or stock prices would become perfectly stable. Volatility is mean-reverting, and, over time, the long-term return to implied volatility will be limited to the spread between implied and realized volatility. Given that selling options has some of the characteristics of an insurance product, one would expect a slight premium to accrue to the options seller. Anecdotal data support this slight premium to the option seller over time, although the data sets available don't include the crash of 1987, which may significantly bias the data.

Appendix 4

My Option Isn't Worth That Much!

You have found a great stock, but it's overvalued by 20%. You'd love to buy it, but it's just too expensive. As a disciplined investor who is savvy about options strategies, you decide that you will sell a cash-secured put at the price you want to pay for shares of this stock. You want the shares and pick an expiration date that is six months in the future. Because you sell a put at 80% of the stock price, which is pretty far out of the money for most stocks, you don't receive much of a premium when you sell it—let's say 6% of the stock price.

A week passes, and when you log on to your brokerage account one morning, you see that the stock that yesterday you thought was so far out of reach has fallen 19% in premarket trading and is now just 1% away from your strike price. You check the news and realize that the company has announced that a manufacturing issue will delay the release of its newest product until after the holiday shopping season.

You start worrying. Perhaps this means the company will continue to fall in the future. Perhaps your idea about what the company is worth is wrong, and the rest of the market is right. Perhaps the company will be unsuccessful releasing any future products until the end of time! Panic sets in. But you're in luck! The stock is not yet trading below the strike price at which you sold the option, so there is still time to rethink this whole buy decision.

You call up your broker and ask him what you have to pay to close your short put. You remember that you got $0.60 when you sold the put, so you figure that you'll just about break even or maybe make a cent or two. What a surprise to find out that your broker quotes you a price of $2.40 to get out of the position, for a round-trip loss of $1.80 per share!

What happened? We see that all three dimensions of an options trade changed in this case, generating a net rise in the option's price. First, the relationship of the strike price to the stock price changed, bringing the option much closer to the strike. Second, because of the company's sudden, unexpected announcement and increased uncertainty, the options market bid up the implied volatility to much higher levels than when you sold the option (again, making it much more valuable). Third, the only ameliorating factor in this scenario is also the one with the smallest effect: time decay. Because a week has passed since you sold the option, the time value of the option has decreased by a small amount. However, because only one week has passed on a contract length of six months (one week out of 24), the effect is very small and is swamped by the factors mentioned above.

What to Do

In the above case and in other similar ones, we think that taking a step back and objectively checking one's original investment thesis against the facts as they present themselves, keeping in mind one's original investment horizon, is the single most important key to success. In the case presented above, what does the manufacturing issue and the missed holiday season mean in terms of the long-term viability of the company? Is it a small company dependent upon this year's holiday season being a big success, or is it a larger, more diversified company that has proved its ability to execute in the past? Considering these factors, as long as one's fundamental thesis for the company has not changed, we would encourage investors to consider the increased probability they will own the stock at a very reasonable price point as an excellent opportunity to beat Mr. Market at his own game. Mr. Market is very short-term focused. As long as your own investment focus is long-term enough to see past the near-term blips, you have an

excellent source of outsized profits—an investment horizon arbitrage opportunity, so to speak.

Also remember that because you sold the put and received cash for that option when you sold it, your realized cost basis for the shares is actually lower than you originally had intended for your cash purchase.

Options Definitions and Examples

Option Education Products

If you have any experience with typical options "education" products being hawked, you'll find that most option coursework focuses on trade execution, independent of the investment research. For example, an advertisement for such a product might read "Say you think a stock will rise by XX% in the next 100 days" and go on to explain how to profit from this knowledge. This separates the company research from the option investment, which leaves a link missing from the chain of logic for the investment. How likely is the event in question? How does an investor get an edge in determining what a stock will do, and, once you have an edge on the valuation of the stock, how do you tie that knowledge to an options strategy?

Gambling

Think of this distinction in terms of Las Vegas. The casinos make sure they have a statistical "edge" (i.e., will end up making money in the long run) before they allow players to place bets. Going to Las Vegas as a player is gambling because there is no expectation that a player can win over the house over the long run. Contrast this example with buying stock in a casino that owns the games and has the edge on the gamblers. Because the casino can reasonably be expected to win, a bet on a casino is investing. In fact, regardless of the game, each time the casino takes a gambler's bet, the casino has a fairly high chance of losing on any individual bet. However, each time the casino puts its capital at risk, it is making an investment because it expects to win on average over time.

Call Example

A real-life example that can represent the value of a call option is that of volunteering as an advisor for a political campaign. For a limited period of time, you pay for the option by working on the campaign, becoming known and respected by the politician seeking office. If the candidate wins, you could have a large upside through an appointment to a political position. However, if the candidate loses, your downside is limited to your efforts on the campaign.

Put Example

A real-world example of buying a put option is purchasing insurance, say on your car, for a year. If your car is damaged in an accident during that year, the insurance must pay you the difference between the value of your car and the post-accident value, which is either the cost to repair the car, or the value of the car itself in the event that the car is totally destroyed. However, if the car makes it through the year unscathed, your losses are limited to the cost of the insurance.

A Stock Is a Call Option

To bolster the intuition of call options, it can be helpful to consider the risk breakdown between stocks and bonds. Investors tailor their risk and return preferences by purchasing a mix of stocks and bonds. In this way, the typical individual investor's portfolio is already full of options. Purchasing a common stock is simply purchasing a call option on the value of a business. A stock is just the upside on the business above the value of the debt. The stockholder gets the uncertain cash flows of the value of the company above the value of the debt. If the company goes bankrupt, the stockholder owes nothing, and the bondholder takes any loss in the value of the company below the face value of the debt. If the company grows in value, the bondholder captures none of the upside above the value of the bonds and the stockholder captures all of the upside to the value of the company.

BSM Flaws

To make the mathematical model work, the BSM model makes a number of big assumptions, but from my perspective the two huge assumptions are: 1) stock prices follow a "random walk" and 2) stock returns follow a "normal" statistical distribution, generating what is called a log-normal stock price distribution. For a more detailed intuitive example, refer to Appendix 2, Black-Scholes-Merton Model—Or Our Drunken Friend.

Volatility

For those familiar with statistical terms, "volatility" is simply the standard deviation of the stock's returns over some time period. Typically it is converted from the time period measured to an annual number or "annualized."

No Free Lunch

We might think that we can buy the upside on a stock, and maybe sell the downside exposure to pay for it. Alas, the cliché holds true, there is no free lunch. (Well, almost never. There are a few exceptions.) So when I'm asked, "Can't I sell overvalued downside and use the proceeds to buy undervalued upside?" I say, "Yeah, buy the stock, it's the same thing." This concept is what option gurus call "put-call parity." If selling the downside and buying the upside didn't equal the stock price (adjusted for interest), you could buy the stock, buy the put, and sell the call, and you'd be guaranteed to make a profit. This is called an "arbitrage."

By now, you should have an intuitive understanding of how equity options work and the range of possibilities that come from their use. If you have any comments or suggestions on this options guide, please let me know at philip.guziec@morningstar.com.

You can put your finger on the pulse of the equity option market on www.morningstar.com/goto/options.aspx and investigate what options are available on your favorite companies using our free option data (known as option chains). Just type the ticker in the option chain box and take a look.

Finally, I hope you'll consider a risk-free trial subscription to *OptionInvestor* by calling +1 866 910-1145 (say code "options").

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