Simon Vine

OPTIONS: OBSERVATIONS of a Proprietary TRADER

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CONTENTS

ACKNOWLEDGEMENTS

I express my gratitude to Donald R. Nichols and Jack Walker who were especially helpful in the final review and editing and in providing great ideas for better structuring of the book.

My colleagues Alekper Safarov and Tatyana Tsiryulik were invaluable for their technical support and search for materials.

INTRODUCTION

Publically traded options have become more accessible, attractive, and essential for personal and professional investors than at any time during the past 30 years. Options contracts now trade on hundreds of domestic and international stocks, commodities, futures, and indices, and they're available (albeit to qualified investors) through nearly every brokerage firm. They're more attractive because greater volatility in global markets enhances options' potential to earn returns and hedge risk. They're more essential precisely because of that volatility: When markets are volatile, you can profit and protect your portfolio by putting less capital at risk. To all that, we might add another factor—namely, that in some regard market-moving events are becoming more apparent to forecast and time, as was the case in the US during August 2011 and in Europe during the spring of 2012. Investors turn to options to benefit from these new opportunities or to reduce risk while implementing strategies reflecting their market views.

The book is ideal for sales professionals, directional investors, and hedgers who want to take advantage of all these opportunities. Those who are new to options may find the recap of theory useful, as main theoretical concepts and their practical implications are condensed in the first two chapters. Some issues that many investors rarely pay attention to are emphasized to help salespeople explain their recommendations. Directional investors hopefully will find valuable the discussion of relative value of different options strategies and their defense in adverse circumstances.

Your author has worked in this business more than 20 years and has used options on a variety of underlying instruments while working in the US and Russia. Hence, this book includes examples from options on different underlying assets as well as from developed and emerging markets. Among the issues the book covers are those that arose during the recent crises. In other words, readers may find those observations informative if they're interested in understanding other options markets and want to be better prepared for events not experienced in their markets.

Chapters covering the basics of trading are based on lectures and presentations the author gave to investors who were starting to use options in their trading or hedging in many countries. The part of the book devoted to directional trading condenses your author's hard-learned lessons as a proprietary options trader when he switched from being an options market-maker who'd managed delta-neutral strategies to a directional investor. Originally, he thought the transition would be relatively easy. That turned out to be a naïve thought. Most OTC and exchange-traded options market-makers have trouble adjusting to directional trading (cash market-makers even more so). Everyone discovers he/they can lose money on any directional options position since they have a nasty tendency to expire before the market makes its predicted turn. Former market-makers suffer a shock when they see profits disappear into the market-maker's bid / offer spreads. These two incidents alone force many investors to consider optimizing his trading merely just to stay in the game.

If you manage money for a fund or want to attract capital under management, those lessons and many others need to be learned under the eagle eye of asset allocators who constantly require stable performance. Needless to say, the adjustment to directional investing is stressful and life becomes easier after gaining the knowledge and experience described in this book.

Similar difficulties await investors, including individual investors, who turn to options after gaining experience trading underlying assets. For most such investors, options provide additional leverage in the preferred direction. Although former market-makers have a less-developed sense of direction than investors who traded the underlying assets, the latter have less feel for factors that affect volatility and less insight into selecting the right strike prices and expiration horizon. This book discusses aspects of options trading that both types of investors lack: building a rational selection process in directional trading.

Options are well-known instruments, and numerous books describe every facet of this complicated business. However, we'll look at practical issues, which are less often discussed. The title of the original version of this book—*Playing Chess-like Games with Options*—reflected how directional options strategies are a multistep undertaking. This book helps you to build upon a series of market scenarios for both the underlying security and its options. Then it assists in identifying opportunities to optimize your available financial resources, thus reducing risks of failure. However, every market participant encounters problems. This book shows ways to defend positions when markets refuse to cooperate. In other words, it reviews well-known aspects of options trading, presents seldom-discussed issues, and builds the multistep investment process required for success in directional trading or advising clients on optimal strategies.

One key to success in any type of trading is understanding market psychology, now a highly publicized concept. Managing your personal psychology is less discussed. Psychological issues involving a specific field such as options trading are nearly unheard of. However, attempting to optimize your trading style without understanding the psychological issues you'll face isn't practical. This book points out reactions and adjustments that have to be controlled. Adapting concepts from behavioral finance to options trading is an especially helpful aspect of this book.

In some ways, this book is built on crumbs of generally known concepts. Some will find the nitty-gritty of options strategies excessively detailed. But those details become valuable once you recognize issues that long have bothered you but which you had no time to explore. Just as no one can fully explain the pain and anguish of being burned unless he has experienced it himself.

PART 1

BASICS OF OPTIONS THEORY

CHAPTER 1

OPTIONS: HISTORY AND HISTORICAL APPROACHES TO PRICING

Brief History of Options

As an options investor you're part of a tradition of speculation and risk management that stretches back four millennia. Evidence of option-like contracts appeared on stone tablets that recorded business contracts in Mesopotamia. One, dated circa 1750 BC, mentions a slave trader who promised to deliver either slaves or a specified amount of silver. Aristotle mentioned what amounts to options trading in fourth century Greece[1]. He told the story of Thales, who expected an abundant olive crop and contracted all the region's available olive presses, thereby gaining an opportunity to resell his contracts later. In the second century, jurist Sextus Pomponius wrote about two types of contracts, one of which resembled what we'd now call a forward contract and another an option.

Authors note that during the Middle Ages derivatives were in use by monasteries and at fairs. The Dutch traded options on herring in the 12th century and actively traded options on tulip bulbs in the 17th century. In 1688, Dutch writer De la Vega's book about financial markets described both contracts for differences (precursors of contemporary contract for differences, forwards, and total return swaps) and options in use before and during the Tulip Bubble (1637). In the UK in 1720, embedded options were a part of the South Sea Company's financing schemes.

In 1857, French writer Proudhon published several manuals outlining derivative trading techniques and their regulatory framework. He named call options an *achete à prime* and put options a *vente à prime*. By the 1870s, options trading had developed on both sides of the Atlantic, and charts were invented showing risk-reward relationships of trading strategies in the form we now recognize. German courts in 1871 began to differentiate illegal gambling from legitimate derivatives contracts, and options contracts were legally enforceable in France by 1885. Publications about options on both sides of the Atlantic date from those days.

In the US, Russell Sage is credited with pioneering options trading from his seat on the New York Stock Exchange in 1872. The options gained popularity because, among other reasons, smaller brokers offered them to clients instead of lending to them on margin as a way to reduce credit risk. These were the first American-style options—as distinguished from European-style options. The former can be exercised at any moment between purchase and expiration, whereas the latter can be exercised only at expiration. They were called "privileges" because they granted buyers the right (privilege) of choosing to exercise them or not.

Moreover, those options investors from the very beginning seem to have been rather sophisticated. If we used today's Black-Scholes model to analyze the skew premium (the higher price for out-of-the-money options versus at-the-money options) on US shares, we'd see that they anticipated the banking crisis of 1873 six months before its onset.[2]

By the early 20th century, options markets were sufficiently developed in the US and throughout Europe that arbitrage trading by telegraph became possible between New York and London. Besides stock options, the FX options market began operating in the mid-19th century and was active at the beginning of the 20th century.[3]

That activity stimulated interest in a specialized options literature. Castelli in 1877 described put-call parity, Higgins in 1902 and Nelson in 1904 explained delta hedging. Haug and Taleb believe that the first formulas for option calculations were published by Vinzenz Bronzin in 1908. In 1967, Van Thorpe and Kassouf offered a mathematical formula that systematized dynamic hedging principles. By applying his findings Van Thorpe became one of history's most successful hedge fund managers, beating the S&P during most of his 20 years managing money.[4] Contrary to common belief, as Haug and Taleb and others point out, options markets were operating soundly before the 1970s—i.e., before invention of the Black-Scholes model.[5]

Today's Black-Scholes formula, now known to most market participants, is essentially a more elegant presentation of long-previously developed concepts. It is, however, its elegance that allowed the contemporary options market to expand and become one of the more powerful financial markets today.

Put / Call Parity and Its Applications

Put / Call Parity

Put / call parity (formerly called the *option arbitrage formula*) is the foundation of options theory and position management. It also has a lengthy history. Known from the late 19th century, it was mentioned by L.R. Higgins in *The Put-and-Call* published in London in 1902 and by S.A. Nelson in *The ABC of Options and Arbitrage* published in New York in 1904.[6]
Both refer to earlier books, including *The Theory of Options* by Charles Castelli in 1877,[7] so this principle may have been known then. The concept is the basis of modern options theory because it balances all market components and does not allow mispricing of combinations of options and their underlying assets (in today's understanding cash / spot / futures / forwards) with similar economic and risk profiles.

To explain the formula we need to recap the basic facts of options trading. On the day of expiration, an option will either expire or get exercised. If a call is exercised, its owner will buy the underlying asset at the *option strike price*. Then he can sell that asset, receiving its current market *price that is higher than the strike price*. If a put is exercised, its owner will sell the underlying asset at the option strike price and will be able to buy it, paying its market price *that is lower than the strike price*[8]. These logical sequences are expressed by the put / call parity formula, a simplified form of which is:

$$\text{Parity} = (\text{Price}_{\text{call}} - \text{Price}_{\text{put}}) = (\text{Price at Expiration}_{\text{underlying asset}} - \text{Option Strike Price}).$$ [9]

Let's demonstrate how the formula works using a simple example with Apple stock option. Let's say you own one $600 Apple call and the $600 put in equal amounts. By options exchange rules, each stock option is exercisable into 100 shares. If the stock trades at $610 on the day of expiration, the call can be exercised—i.e., you can buy the stock at $600 per share and sell it for $610, gaining $1,000 (100 shares x $10 per share). Instead of exercising the call, you can sell it for $1,000. The corresponding put in this situation expires worthless.

If at expiration the stock trades at $590, you can sell the stock at $600 per share and buy it for $590, or you can sell the put for $1,000, Therefore, the put is worth $1,000, while the call is worthless.

Let's apply this logic to the formula. On the day of expiration, the prices of the call and the put will equal the difference between each option's strike price and the price of the underlying asset. When the call and the put have equal strike prices, at expiration your gain on one means the loss on the other. As a separate case, if at expiration the stock trades at $600, both the call and the put expire worthless, while (Price at $\text{Expiration}_{\text{underlying asset}}$ − Option Strike Price) is equal 0. Please note that if you buy the call and the put simultaneously, you have a chance to profit if the stock moves either direction.

Now, let's try a variation that forms the basis of modern options theory and is described in its many explanatory books. What if you buy two $600 Apple calls and sell short 100 shares of Apple instead of buying one call and one put, as in the example above?

- If on expiration day the stock trades at $610, the call will be worth $2,000 (2 x $10 x 100), while the position in shares will lose $1,000 ($10 x 100). In total you will make $1000.

- If on expiration the stock trades at $590, the call will expire worthless, whereas the short sale will earn you $1,000 ($10 x 100). In total, you earn $1,000.

What if you buy two $600 Apple puts and buy 100 shares of Apple?

- If on expiration the stock trades at $590, the put will be worth $2,000 (2 x $10 x 100), while the position in shares will lose $1000. In total, you earn $1000.

- If on expiration the stock trades at $610, the put will expire worthless, while the position in shares will earn $1,000. In total, you earn $1,000.

In all three cases the results of similar moves up and down are the same notwithstanding the difference in positions. Especially interesting are the latter two examples, where the position based on the call gives the same result as the position based on the put. If there is no difference in their economic performance—i.e., they provide similar benefit—would you agree that their price should be the same? Hence there should be parity between the prices you pay for both positions.

Two Important Remarks

Simple adjustments to the logic above, which we'll discuss in later chapters, show that put / call parity works not only at expiration, but any time prior.

In the market vernacular, the options in the second and third examples were "hedged with the underlying." As you saw, the performance of the hedged positions in our examples was the same when the underlying asset moved in either direction. This observation leads to an interesting and crucial detail: options pricing models assume an equal probability that prices of the underlying asset could rise or fall. That is, they ignore directional forecasts of the underlying asset's price! In other words, prices of a call and a put with the same strike price and expiration date should be identical. This is a very foreign concept for those who trade the underlying positions which by nature are directional. We will expand on this concept in the next chapter.

Applying the Option Arbitrage (Put / Call Parity) Formula to Determine the Two Components of an Option Premium's Intrinsic Value and Time Value

An option premium consists of intrinsic value and time value. Assuming you can exercise a purchased option at any time at a profit, the gain you'd earn is called the option's *intrinsic value*. In the examples, above if on expiration of one $600 call the stock trades at $610 then its intrinsic value was $1,000 (1 x $10 x 100). Besides intrinsic value, option prices contain *time value*—that part of the option's price that reflects the worth implicit in how long you control the right to buy or sell the underlying asset. In fact, the idea behind options is essentially to gain ownership of time value. If there is none, the option in economic terms doesn't exist!

As shown above, the potential gain of both hedged calls and hedged puts with the same strikes and expiration dates is the same. Hence their time values should be identical. It's up to you whether you hedge, but since the theory assumes you will, their time value should be equal. This is not to say that their *premiums* will be equal. For example, if the current share price of Apple is $610 and the price of one $600 Apple call expiring in three months is $1,800, the call's intrinsic value is $1,000 (1 x ($610 − $600) x 100). Its time value is $800 ($1,800 − $1,000). Therefore, the time value of the $600 Apple put is also $800. Because this put is out of the money, its intrinsic value is 0.

If the price of Apple is $592 and the price of one $600 put is $1,500, the put's intrinsic value is $800 (1 x ($600 − $592) x 100). The time value is $1500 − $800 =

$700. Therefore, the time value of the equivalent $600 call also would be $700. Since this call is out of the money, its intrinsic value is 0.

Moneyness

Investors also refer to options by the relation of their strike price to the current price of the underlying security, called *moneyness*. That is, they say an option is *ATM* (at the money), *ITM* (in the money), and *OTM* (out of the money). Options with intrinsic value are called ITM. Options whose strike price equals the current price of the underlying are called ATM. Finally, options which have no intrinsic value and are not ATM are called OTM. We will use those abbreviations throughout the remainder of the book.

Hedge Ratio, Delta

Earlier we noted that option hedging has existed since late 19th century. Back then, dealers realized that options with different strikes required different quantities of the underlying hedge. The relationship of the amount of hedge to the amount of the option was called the *hedge ratio*. It was equal to the probability of an exercise that the dealer attributed to a given option. Nowadays we call the hedge ratio *delta*, and we calculate it using Black-Scholes or other options formulas.

Delta shows sensitivity of the option premium to the changes of the value of the underlying value. To give a practical example, if you own a call on shares of a particular company, a delta of 0.50 means that for every $1 increase in the price of the underlying stock, the option's price—its premium—rises $0.50. In practice, the decimal point is ignored; the delta is said to be 50, and the option is said to be 50-delta. ATM options are 50-delta. Delta of ITM options exceeds 50%, and delta of OTM options is less than 50. A deep OTM option, i.e. an option with delta close to 100, will change in value at the same rate as the underlying.

Application of Put / Call Parity for Building Synthetic Positions

The relationship of put and call prices established by put / call parity permits traders to combine options and forwards to create *synthetic positions*. Parity also was the basis for the claim that the time value of calls and puts with the same strike must be equal. Let's review the concepts above using the example of a trade in the euro (€) against the US dollar ($), commonly called a "EUR / USD." Let's say that the price of two-month 1.2600 EUR puts and calls is 150 USD pips.[10]

First, let's note that by combining an underlying asset with an option on it, you create a position that behaves like another option. For instance, let's say you bought *a put* that entitled you to sell €1 million against the dollar at a price of 1.2600. Simultaneously, you purchased €1 million (the underlying) at a price of 1.2600. This position will behave the same as if you'd bought *a call* that entitled you to purchase €1 million at a price of 1.2600.

To demonstrate that conclusion, consider how the values of both positions change if the spot price of the euro is 1.2700 on the day the puts expire.

- Let's for simplicity assume that the premium paid for the options was equal 0. The 1.2600 put would expire worthless, and you would lose the amount you paid for its premium. However, your long position in the euro would gain 100 pips (1.2700 − 1.2600 = 100). In this case, buying a put and the underlying asset produces the same gain as if you'd bought a 1.2600 call. In buying the put and buying the underlying asset, you created a *synthetic position* the equivalent of buying a 1.2600 call.

To confirm, let's examine the opposite trade. Let's suppose you bought calls that entitled you to purchase €1 million at 1.2600. Simultaneously, you sold €1 million against the dollar in the forward market. When the options expire, the spot price of the euro is 1.2500.

In this case, a call with a 1.2600 strike price would expire worthless. However, you gain 100 pips on the sale of euros (1.2600 − 1.2500 = 100). In this case, your profit is 100 pips. In buying a call and selling the underlying asset, you created a *synthetic position* the equivalent of buying a 1.2600 put.[11]

Numerous combinations can be used to create synthetic positions. They include:

- Short underlying + short put = synthetic short call
- Short underlying + long call = synthetic long put
- Long underlying + short call = synthetic short put
- Long call + short put = long underlying

A chart of the profit and loss (P / L) profile of the portfolio (Long Put and Long Underlying) looks like the graph of the long call position. The same is true for other synthetic positions and their regular equivalents. It's important to remember, however, that put/call parity works best for ATM options (50-delta).

Application of synthetic positions

If you buy €1 million of the 1.2600 EUR / USD calls (EUR call) for 150 pips when the EUR / USD trades at 1.2650, the call's intrinsic value is 50 (1.2650 − 1.2600) pips, and its time value should be 100 pips (150 − 50).[12]

As we know, the time values of calls and puts with the same strike and expiry should be equal. Thus, if the put's price is greater than 100 pips, there is an *arbitrage* opportunity—i.e., you can sell the put and buy its synthetic equivalent at a gain without market risk for the combined position. In other words, you can sell €1 million of the 1.2600 put for, let's say, 110 pips, then do a dual trade: sell €1 million against the USD, and simultaneously buy the 1.2600 call at 100 pips. You will net 10 (110 − 100) pips.

Option Pricing Components

Although put / call parity helps to explain the price relationship of puts and calls, how did investors price either before modern formulae were invented? Let's review a method used in the 19th century to calculate an approximate price for options. Back then, traders would review a few years of a stock's previous prices and calculate its *volatility* (in those days they called volatility "fluctuation"). They then would compare historical price fluctuations for a period equal to the option they were considering. For example, they would measure a stock's historical two-month fluctuations if they wanted to price a two-month option. An especially scholarly trader might also have calculated the volatility for a group of stocks within the same industry. She would also consider costs such as commissions, cost of capital, and perhaps a credit risk charge based on the historical default rate of counterparties.

Although the aforementioned authors didn't show calculations for OTM options (in those days they were called Call-of-More, while OTM puts were called Put-of-more), we can follow their general logic to price one as they might have. Suppose the trader wants to sell a one-month call with a strike price of 120 on a stock selling at $100 (Table 1.1). Based on historical fluctuations and his forecast, he would evaluate the probability that the stock would close within a particular price range within a one-month period. He would then calculate a price for the call by summing the range of possibilities and weighting the likelihood each would occur.

Table 1.1
Approximate Calculation of the Option Premium (Current stock price is $100)

Stock Price Range	The estimated range probability in 1 month	The 120 call's intrinsic value at the mid-range price	Calculation of the 120 call's premium
Below 60	.03	0	0
60–70	.05	0	0
70–80 and 80–90	.065	0	0
90–100	.09	0	0
100–110	.14	0	0
110–120	.25	0	0
120–130	.14	0	0

Thus, assuming equal chances the stock will move up or down, the trader would assess the option's approximate premium at $3.875.

How would the trader estimate a premium for a longer-dated option? By widening the underlying price ranges and the probabilities to accommodate the longer period. For instance, for an option expiring in two months he would consider the wider range of outcomes and different probabilities. The 120 strike would end up closer to the middle of the distribution and thus likely would be more expensive. For example, the probability the stock's price will fall within the $120–$130 range increases from 0.09 to 0.12. Hence, his estimated price for the longer-term call will increase. As we've noted, this 19th century calculation proved to be reasonably accurate when judged against today's more complex pricing techniques.

In the 1970s, the logic of the valuations above served as the basis of the Cox-Rubinstein Equation (1979) that values American-style options. However, the first "modern" formula for pricing European options was developed in the early 1970s by Fischer Black and Myron Scholes. Their formula uses different inputs to calculate the option's price. They are:

- The price of the underlying asset

- The strike price of the option

- The option's expiration date

- The financing rate for the underlying stock, its rate of return (dividends in the case of shares, coupon in the case of Eurobonds, the rate of financing of a second currency in the case of currencies)

- The implied volatility.

The next chapter goes over the principles of option pricing using these parameters.

CHAPTER 2

COMPONENTS OF OPTIONS PRICING AND CALCULATION SHORTCUTS

Chapter 1 discussed basic components of options prices. They included current price of the underlying asset, the option's strike price, and its time to expiration. Also important are financing costs, asset yield, and volatility, which we elaborate upon in this chapter. Although later portions of this book speak to advanced investors, those who didn't study math might appreciate a review of several issues, and those who did may find the section on theta useful, for it's the base for later discussions of spread strategies. Other sections are intended for salespeople whose more knowledgeable clients likely follow risk measures ("Greeks").

Forward Price

Once you understand forwards you'll understand how real or implied costs of financing the underlying position affect real or implied options prices. The *forward price* of an underlying asset embodies three elements: its current price, its yield, and the cost of financing it. Suppose you want to buy one share of Apple stock for $600 and must borrow the entire $600. That proposition can be expressed as: Apple / USD. It reads "You pay $600 for one share of Apple." You intend to own Apple for one month. If you finance your purchase with overnight loans, you'll "roll" each one-day loan more than 20 times. It's easier to borrow $600 for one month at, say, 12% annualized interest.

Question: How much will you eventually pay to hold Apple under those conditions?

Answer: $606 [600 + (600 x (12% / 12))].

$606 is the current forward price of your one-month investment in one share of Apple. In other words, today you are indifferent between buying the stock at the current price ($600) or at a forward price ($606). The higher your financing cost, the more the forward price differs from the current price.

Suppose Apple will pay a $6 dividend this month. Apple's forward price takes the dividend into account by subtracting the interim income from the forward price:

(\$606 − \$6) = \$600. Why? Because investors should be indifferent between buying the asset at today's price (cash price paid "on the spot") or at a forward price. For instance, if the loan to buy Apple was interest-free, the forward price of the stock would be \$594 (\$600 − \$6). In other words, investors who bought Apple today planning to hold it until the forward date, and to collect the dividend should buy it at a discount or readily sell it at the forward price that is higher by the amount of intended dividend.

In sum, a forward price embodies an asset's financing cost and yield, so investors should be indifferent between holding the asset today or for a given term. Those are all the secrets there are to forward pricing. Its simplified formula is

Forward price = Current price x (Financing Cost / Yield of the Asset).

As you see, the higher the financing cost, the higher the price you'll require for selling one month forward.

If you deal with a foreign exchange forward, follow the same logic. To start the discussion, recall that in the pairing GBP[13]/USD, "GBP" is called "the currency," whereas the USD is called "the counter-currency."[14] For instance, the GBP/USD rate declares how many dollars are needed to buy 1 pound. Currency pairs are like the pairing Apple / USD. The pound is the asset, and the dollar is the financing currency. The formula implicitly incorporates the cost (interest paid) of borrowing dollars to finance buying pounds (which pays a yield in the form of interest received). The greater that cost, the higher will be the forward price over the spot price. On the other hand, the higher the interest that investors could receive by owning pounds, the lower is the forward price in relation to the spot price.[15]

Q&A

To assure this material is set in your mind, let's review some questions.

Question: If today's price of a currency is 1.00 and its one-year forward trades at 1.10, which interest rate is higher— the currency or the counter-currency?

Answer: The currency interest rate is above the counter-currency rate. The financing rate is higher than the yield of the asset.

Question: If you‘re indifferent between selling a stock at today’s price of 50 or at 45 in one year, which is higher—the financing rate or dividend rate?

Answer: The asset’s yield exceeds the cost of financing the trade. For a stock, that means its dividend exceeds financing costs.

Question: Instead of a transaction involving currencies, suppose it involves Tractors / Ice cream and the current rate is 100, while the one-year forward is 115. Which yield is higher?

Answer: This one’s a no-brainer. Tractors yield less than ice-cream; ask your kids! Anyway, this is similar to Question 1.

Volatility

Of all factors that an option’s price depends on, two are primary: price changes in its underlying asset and the underlying asset’s volatility. We calculate volatility by finding the annualized standard deviation of the logarithm of the daily changes in the underlying asset’s (closing) price. Volatility is the same regardless of which way prices move; only absolute values matter. It’s critical to understand this fact because investors other than options market-makers base their forecasts on market direction.

There are three types of volatility. *Historical volatility* is the actual volatility of an underlying asset over a previous period. *Implied volatility* is the market’s estimate of the underlying asset’s future volatility. *Implied historical volatility* is the historical record of the underlying asset’s implied volatility. All three volatilities are different when measured for different periods.

Implied Volatility

Implied volatility is the most important for options pricing of the three. It is also called *expected volatility*. It depends on several factors. Chief among them is historical volatility; especially, significant recent market fluctuations are likely to keep expected future volatilities (“vols”) high.

Another factor is *political and economic calendars* (elections, economic releases, etc.): The volatility (price) of options that expire after economic data are released ("figures") is normally higher than for options that expire before release dates because new information may cause a substantial market move. That's why implied volatility on days before G8 meetings is lower than on days after. The same holds true for elections. A newly elected government can redefine a country's economic policy, and uncertainty over election results causes options prices (implied volatility) to increase.

Market liquidity (demand / supply) affects implied volatility. Implied volatility is an essence the price of an option expressed in non-monetary terms. As any price volatility is a matter of demand for and supply of an option. If selling exceeds buying, prices decline, and vice versa. In other words, if market-takers (clients) "sell volatility," implied volatility declines, even if market-makers expect increased volatility.

Changes in technical levels are also significant. If the price of an underlying asset breaks through significant historical levels, the options market expects a volatile follow-through. Significant historical price levels can be identified by conventional technical analysis. They include trend lines, support / resistance, and previous historical highs / lows.

Numerous other factors influence implied volatility, so it isn't entirely accurate to say implied volatility is a forecast of future volatilities. We address how the market estimates implied volatility in Chapter 4. However, let's leave that issue and turn to other more extensive and less intuitive definitions.

Implied Historical Volatility

Implied historical volatility is the history of predictions about implied volatility. Market-makers use implied historical volatility when they determine implied volatility. Average implied historical volatility for options varies depending on their underlying asset. For EUR / USD over a period of one to three months, it's around 11%. For copper, it's 25%. For the DJ Index it's 18%.

Historical volatility

Historical volatility (also called "realized volatility") isn't especially important for determining implied volatility unless it's very short term. Implied historical volatility also is interesting mostly when markets reach extremes in volatility, and those occasions are rare. They are also sometimes useful for relative value trading. Say you're deciding between a two-month and a three-month strategy and are seeking a "better value" in terms of implied volatility. You'd examine actual historical volatility and the volatility presently implied in the prices of the two-month and three-month options. Having done so, you may discover differences in the degree to which current implied volatility, which anticipates future volatility, are related to historical volatility for the periods.

Other things being equal, you prefer to buy the option whose present price (in implied volatilities) is lower comparing to the historical volatility of a similar time frame. In other words, if the two-month historical volatility is 10 and implied is 11, while the three-month historical is 10.5 while the corresponding implied is 12, you'd prefer buying a two-month option where the implied is closer related to the historical.

Historical volatility and implied historical volatility differ for many reasons. Historical volatility is calculated from historical data; implied volatility is a prediction by market participants of future behavior. Also, implied volatility takes into account intraday market fluctuations, whereas historical volatility is calculated from daily closing prices.

Hedging: Delta-neutral Positions

Investors must assess market volatility and its effect on a total portfolio. To do so they must understand hedging. Most theoretical options concepts assume that options are hedged using the underlying asset. That is, through purchases and / or sales of the option and its underlying asset against each other, investors minimize their directional exposure to price movements in either one. In such cases, their total positions—the option and its underlying asset that hedges it—are said to be *delta-neutral*: investors make (or lose) offsetting amounts if the price of the option and the underlying asset change in either direction of the underlying price by the same small increment.

The amount by which the option price changes when the underlying price moves is called delta or hedge ratio.

For instance, say when an asset trades at $100 you buy 10 units of a $100 call that's 30-delta. You need to sell three (10 x 30%) units of the underlying asset in order to hedge. So, you sell 3 units at $100 and your portfolio becomes delta-neutral. Now, the value of the option changes by the same amount as the hedge in the underlying asset as long as the deviations of the current price of the underlying asset changes a bit.

If the price of the underlying asset changes by more than small increments, the option's delta changes. To restore the total position to delta-neutral, investors buy or sell the "extra delta." The more volatile, up and down, that the market is, the more frequently delta changes and therefore the more frequently the option can be re-hedged.

Suppose the price of the underlying hits 105 and the option reaches 45-delta. At that point, to bring the portfolio back to delta-neutral managers can sell 1.5 more units of the option (10 x 45% − 10 x 30%). In total they sold 4.5 units.

Let's say that thereafter the underlying moves to 95 and the call falls out of the money (becomes 20-delta). To hedge, to make the portfolio delta-neutral, an investor needs to hold only two units of the hedge (10 x 20%). To make the position delta-neutral, they buy back 2.5 units (4.5 − 2). The profit realized from hedging is 20—i.e., [(1.5 x (105 − 95)] + [1 x (100 − 95)] = 20.

During this period, the call's *seller* does the opposite to hedge the call he sold. Theoretically, the market determines the "correct" level of implied volatility when buyers and sellers "agree" on implied volatility and execute a trade. At that moment they de facto agree how much money can be made or lost on the hedge given their opportunities to re-hedge. In practice, everyone hedges differently. That's why most traders follow their individual intuitions about implied volatility based not only on their market views or liquidity but also on their approach to hedging. To determine the correctness of the implied volatility of short-term options, investors compare indicated implied volatilities with their own calculations, based on individual expectations of hedgeable daily price ranges.

This seemingly insignificant difference in styles leads to the fact that delta-neutral options trading isn't a zero-sum game. For instance, investors re-hedge a long option near the daily extremes of the underlying asset's price (i.e., sells high and buys low), whereas the option's seller hedges at the day's closing prices. The intraday close-to-close ranges are normally narrower than high-low ranges. Hence, both managers can make money on the same option.

Simple Formula for Calculating Short-Term Implied Volatility of ATM Options

Almost everyone uses the following shortcut to estimate implied volatility of short term options.

Say you expect EUR / USD to move 125 pips a day, and the current spot is 1.25. What is the daily implied volatility? Answer: (0.0125 / 1.2500) x 16 = 0.16.

Why multiply by 16? It's the square root of 265—the approximate number of business days per year. Some people prefer to use 19.1—the square root of 365, the number of calendar days per year. You can fine-tune your formula using the number of business days in your country. Doing so isn't critical, but it will account for the number of business days differing from country to country and year to year.

In this case, you expect the implied volatility for options expiring in the near term to be around 16%. Conversely, if your broker tells you that the implied volatility of the AUD / USD is 8% while the spot is 0.95, that means the market assumes a daily *hedgeable* range of 47.5 pips (0.08 x 0.95) / 16.

Statistically, that assumption of 47.5 pips means the market expects that closing prices for two-thirds of the trading days will differ by 47.5 pips or less. The difference of 2 x 47.5 or less will hold true for 19 out of 20 days. However, the market expects the difference to exceed 2 x 47.5 on one day in 20. The statistics don't tell us by how much the market can or will exceed the range, and unexpected moves can be substantial. Risk managers use such a calculation only to set limits.

Another cautionary note: historical volatility of the underlying asset is calculated based on daily *closing prices*. At the end of the day, the shortcut calculation is most useful for short-dated options. As you probably noticed, this shortcut grants leeway in assuming the number of relevant days, price ranges, and other factors. The important thing when using this shortcut is to be consistent and to use the same principles over time.

To calculate volatility for a period other than one day, change the daily maximum and minimum for the maximum and minimum of the corresponding period. Then to calculate the annualized time factor use the formula $\sqrt{365/N}$, where N is the number of periods during the year. For example, to calculate a one-week volatility instead of 16 use $\sqrt{365/52}$, since there are 52 weeks per year.

Although traders rarely use such calculations for periods longer than one day, analysts often mention them.

Implied Volatility Curve and Skew

To complete this section on volatility we cover two final definitions. The graph of implied volatilities for different expiries against time is called the *volatility* *curve*. The difference in implied volatility for options with the same expiration but different strikes is called *volatility skew*. There are several reasons for apparent differences in skew. Sometimes skew reflects expectations about which direction price moves are prone to gap.

Remember, options theory assumes that prices of underlying assets are continuous, but in real life they aren't. To compensate for this hole in theory, market-makers charge an extra volatility premium for OTM options in the direction of possible gaps—that is, for that one day out of 20 mentioned above. At times, the difference in implied volatilities may also be caused by liquidity preferences: there can be many sellers of some strikes or buyers of others, normally reflecting the directional view of the market. But there are other reasons. We'll return to this concept in detail.

Gamma

Definition of Gamma

Delta shows the change in an option's price with respect to the price change of an underlying asset. In other words, it measures the speed at which the option's price changes per one-point move in price of its underlying asset. By comparison, *gamma* measures the speed at which delta changes as the price of the underlying asset changes. In other words, delta measures the speed of premium change while gamma measures the acceleration of the change.

Let's revisit the example above. You bought 10 units of a 100 call, which had 30-delta. The underlying reached 105, and the option reached 45-delta. The increase from 30 to 45 was due to gamma. A single option has different deltas when the price of its underlying asset varies. Gamma shows the extent of delta change per one-point change in the spot / cash price.

Absent gamma, a two-point move in price of an underlying asset would change an option's price twice as much as a one-point move. But with gamma, an option that appreciated 10% on the first one-point spot move will appreciate 25% on the second one-point move. In this example, appreciation in the option price accelerates. During the second portion of the move, gamma is $(25 - 10) / 10 = 1.5$. Gamma is measured in percentage points or in basis points. If a 50-delta option has a gamma of 10%, it will have either 49 or 51 delta if the spot price changes 10 pips.

Gamma in Practice

Gamma is a well-explained concept and plays a slight role in this book. However, its familiar characteristics deserve note.

- Short-term options have higher gamma than long-term options (Table 2.1).
- ATM options have the highest gamma. The further an option's delta from 50% (ATM), the lower its gamma of an option. For instance, 75-delta and 25-delta options have similar gammas.
- Price changes of the underlying asset have greater effects on the price of higher-gamma options. That's why prices of long-term options change like their delta-equivalent (or spot) when an underlying asset price moves. That is, they have very low gamma.

Table 2.1
Gamma of USD / CHF Options with Different Maturities and Deltas (in %)

Delta\Maturity	1 Week	1 Month	3 Months	1 Year
20	+28.15	+8.81	+5.16	+2.58
30	+34.92	+10.91	+6.38	+3.15
50	+39.96	+12.37	+7.14	+3.37

- Two options with equal deltas but different gammas will behave differently: the price of an option with higher gamma will increase or decrease faster than that of a lower-gamma option (if compared within one day and priced at similar volatility).

- The higher the gamma—that is, the higher the probability of the option's price increasing—the more you must pay for it in time decay if the market moves in your direction. In other words, if your position gains value quickly, it also loses value quickly from time decay, if the favorable market move doesn't occur immediately.

- ATM options sustain their gamma the best. We will show the behavior of options with other deltas in Figure 2.3.

Short and Long Gamma Positions

A hedged position is called *long gamma* if it makes money when the price of the underlying asset moves and *short gamma* if it loses money with the underlying asset's price changes. The phrase "It makes money with the spot move" implies movement in any direction of a hedged position.

Theta

Intrinsic Value and Time Value

An option's price is comprised of two parts: *time value* and *intrinsic value*. Intrinsic value is the positive difference between the price of an underlying asset and the strike price of the option. It's the amount the owner would receive if she exercises her option. For instance, if she is long a 100 call and the stock currently trades at $110, the option's intrinsic value is $10 because she could receive ($110 − $100 = $10) = $10 if she exercises the option. Only an ITM option has positive intrinsic value.

Time value is the difference between an option's price and its intrinsic value. Time value is the reason to buy options—it's the cost of the opportunity to make money with less risk than if you executed the same strategy using only the underlying asset. All else being equal, the more time remaining until an option expires, and / or the greater the likelihood it will end up in the money, the more expensive it is. Therefore, the main factor that drives time value is time remaining until the option expires. Neither ATM nor OTM options have intrinsic value.

Definition of Theta

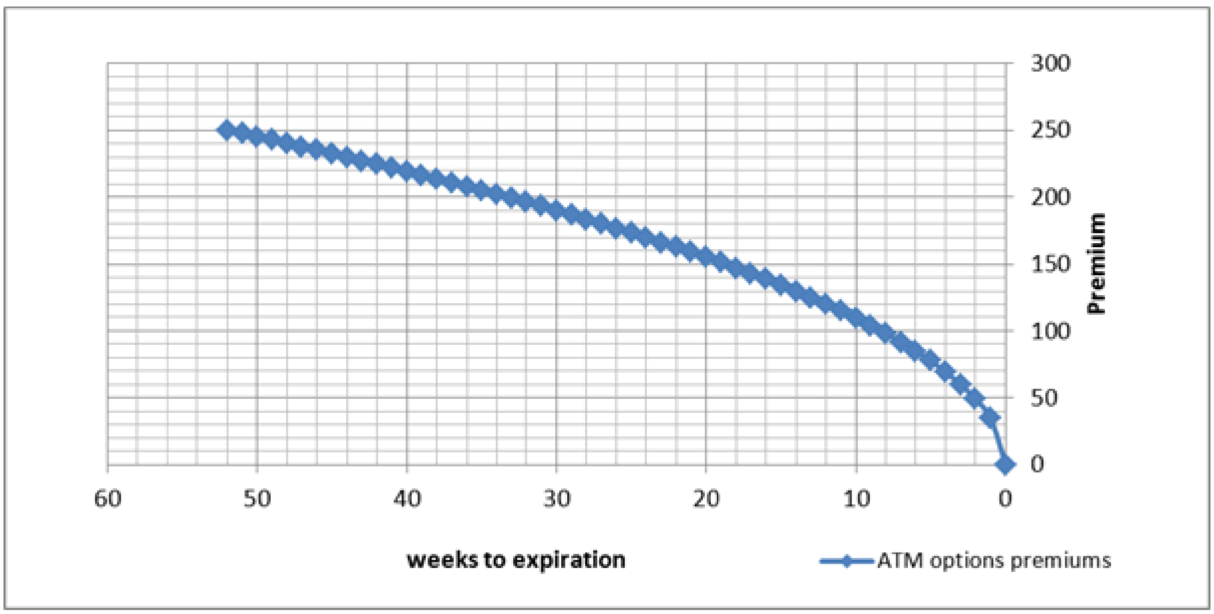
Theta[16] measures sensitivity of the time value portion of an option's price to time remaining until expiration. For instance, if the price of an OTM option is 10 and theta is 2, it will lose two ticks overnight and be worth 8 tomorrow.

If you're a broker explaining theta to investors, you must point out that only time value is amortized. Intrinsic value isn't. We emphasize this point for those who mistakenly look at the sensitivity of the entire price of ITM options to changes due to theta and vega. That's why in-the-money options may not be as expensive as they look because their time value can be significantly small than the price. We return to this point when we discuss investing in options that are deeply in the money.

Basic Characteristics of ATM Options Theta

Figure 2.1 shows premiums (time value) of at-the-money options with different expirations are related to each other through the square root of annualized time remaining until expiration, assuming volatility and forward curves are flat (similar interest rates of both currencies, or similar dividend / financing rates).

Figure 2.1
Change of ATM Options Prices Over Time



As Figure 2.1 shows, the curve takes the shape of the square root function. The option price in Figure 3.1 is calculated by multiplying an ATM one-year option price by a factor equal to $\sqrt{annualized\_time\_remaining\_until\_expiration}$[17] assuming that financing / dividend rates equal 0 while the volatility curve is flat.

For example, three months is 90 days or approximately ¼ year. Hence, the value for a one-year ATM option is X. Then the value of the three month at-the-money option is X x $\sqrt{annualized\_time\_remaining\_until\_expiration}$, i.e., X / 2.

To calculate the price of an ATM option with any other time to expiration, you can take a known premium of any ATM option expiring on a different date (for periods less than one year) and multiply it by a time factor that relates time to expirations of different ATM options. Remember that this calculation doesn't work perfectly if the volatility curve isn't flat or if financing / dividend rates don't equal 0.

Shortcut Relationship of Price of ATM Options with Different Expirations

Table 2.2 shows prices of ATM options for a stock priced at $609 per share, assuming flat implied volatility and financing curves (dividends and funding equal 0). As you see, the price of the option approximately doubles with changes in term from one week to one month, from one to four months, and from two to nine months.

Table 2.2

Relationships of Prices (in %) for ATM Options with Different Expiration Dates

Days	**7**	**30**	**60**	**120**	**270**
Strike Price	609	609	609	609	609
Option Price	11.25	23.27	32.90	46.47	69.51

Table 2.2 is a visualization of the square root rule. The relationships are important to remember when making a quick-and-dirty selection of strategies. Brokers can use this table to tell clients why two sequential one-month ATM options cost more than one two-month ATM option. They can also roughly estimate prices of options with these expirations, knowing, for instance, that a one-week option is twice as cheap as a 30-day option. In other words, the relationship provides a useful shortcut to approximate prices of different alternatives.

The reverse point is also important and also not intuitive. Theta of ATM options with different expiration dates is also related through the square root of time remaining to expiration. *The closer an ATM option is to maturity, the greater is its price decay*. For instance, you might invest $10,000 in a $1 one-week ATM option or in a $1 one-month ATM option. The one-week option has higher theta; therefore, its price will decay faster. At the end of the week, the price of the one-week option will be 0, whereas the one-month option will retain most of its price.

That simple example illustrates another point important for non-professional options users: why the size of option's price doesn't correspond to the size of its theta. Even if a long-term ATM option's price seems high, it won't necessarily lose its time value rapidly. Bear in mind, however, that we're discussing only amortization of time value.

Components of Theta: Time Decay

Let's address some issues related to theta that aren't broadly discussed because they're distantly relevant in practical application. If you looked at the mathematical formula for theta, you'd note it depends not only on time remaining to expiration but also on volatility as well as the difference between the funding rate and dividend rate (or in case of foreign exchange options, the difference in interest rates of two currencies). Hence, when volatility is higher, theta will be larger, given identical interest rates. To split theta's composition into its volatility and rates, first set rates equal to 0 to reveal the effect of volatility. Whatever theta remains after you subtract the effect of volatility is attributable to interest rates—i.e., due to the financing component of theta.[18]

Who's interested in this calculation? Whoever wants to understand how much he pays solely for the opportunity to benefit from market volatility—i.e., for the opportunity to make money on options. If brokers need to convince a client that an option is cheap, they can mention that in the case the client hedges, a substantial part of premium will return in the form of financing. By the same token, investors like having an indication of how much extra they pay or receive in financing. For both directional and delta-neutral positions, especially involving high-yielding stocks or currencies, this component can add up.

In practice, the financing implied in the options and paid/received in reality may be different for investors with different credit arrangements unless they deal through an exchange or work for a highly-rated institution. In option pricing you use the interest rates used by highly-rated institutions. When you borrow or lend funds on your hedge, you likely use other pricing arrangements. Besides, the original expected financing result is unlikely to be achieved because in practice investors re-hedge positions, so the original amount of their hedges changes, and the eventual funding cost / income may differ from those implied in the option's initial price.

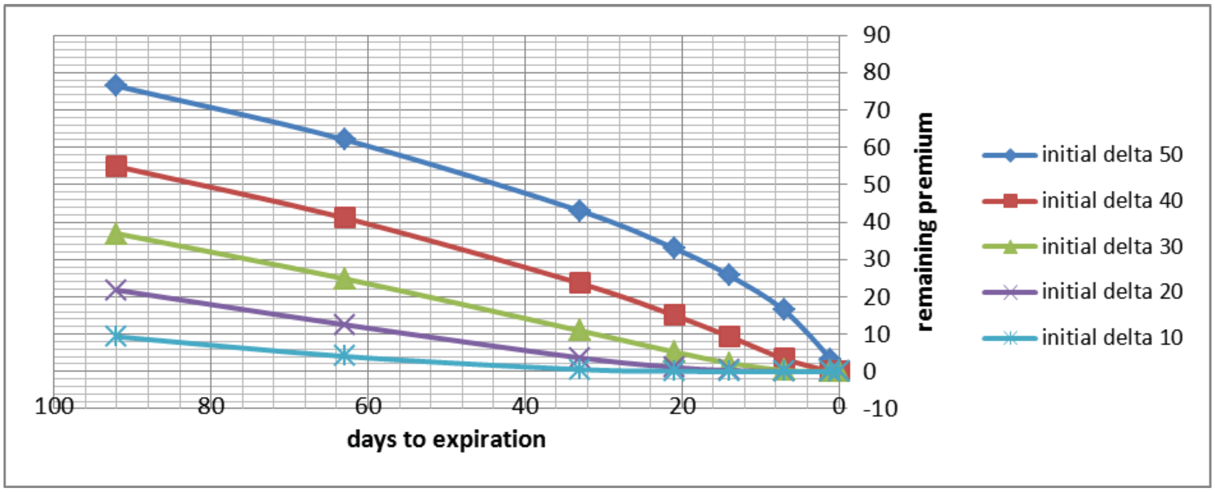
Another peculiarity is that people use the terms *theta* and *time decay* interchangeably. Long ago there was a minute difference in the terms. Theta assumes that interest rates and their differentials remain constant from the moment the option is acquired until it expires. Time decay assumes the interest rate curve—i.e. different rates for different periods. In other words, when rate curves are flat, there's no difference between theta and time decay. When rates for different terms differ significantly, for time decay the systems will be using the point on the interest rate curve that corresponds to the time remaining to expiration, rather than the interest rate originally used to price the option.

Theta Behavior of Options with Different Deltas

The decreasing time value curve in Figure 2.1 depicts the behavior of at-the-money options. Options with other deltas lose value *on different schedule*. For instance, amortization of short-term 25-delta options resembles a straight line. Time value decay of deeply in-the-money (more than 80% delta) or far-out-of-the-money (less than 20% delta) options may well decelerate as expiration approaches.

Figures 2.2 and 2.3 show the effect of changes in time to expiration on options' prices and deltas. To make the demonstration more effective, in Figure 2.2 the options' strike prices are fixed throughout its life until expiration. The option that originally was 20-delta loses more than half its price in the beginning of its life. The theta of what originally was a 30-delta option behaves more like an ATM option—i.e., its loss of value accelerates as expiration approaches. In other words, the dynamics of time value loss of different delta options are different. Moreover, options that are cheapest and most recommended by salespeople lose their value the fastest.

Figure 2.2
Price Behavior of Three-month Options
with Different Deltas as They Approach Expiration



This discussion bears significantly on topics discussed later in the book.

In *absolute* terms, time decay of low-delta (or high-delta) options is less than that of ATM options. But given investments of equal amounts, the notional price of a 25-delta option for $1 million is double that of the ATM option. For instance, theta of a one-week 25-delta put is 3.1, and theta of a one-week 50-delta put is 3.9. If you buy $2 million face of a 25-delta option for $1 million, it loses 6.2% overnight. At the same time, if you buy $1 million of a 50-delta option for $1 million, it loses 3.9% overnight. That is, 3.1% multiplied by 2 is more than 3.9 multiplied by 1. Therefore, *the value of your investment in lower-delta options falls faster, although the amounts invested are the same.*

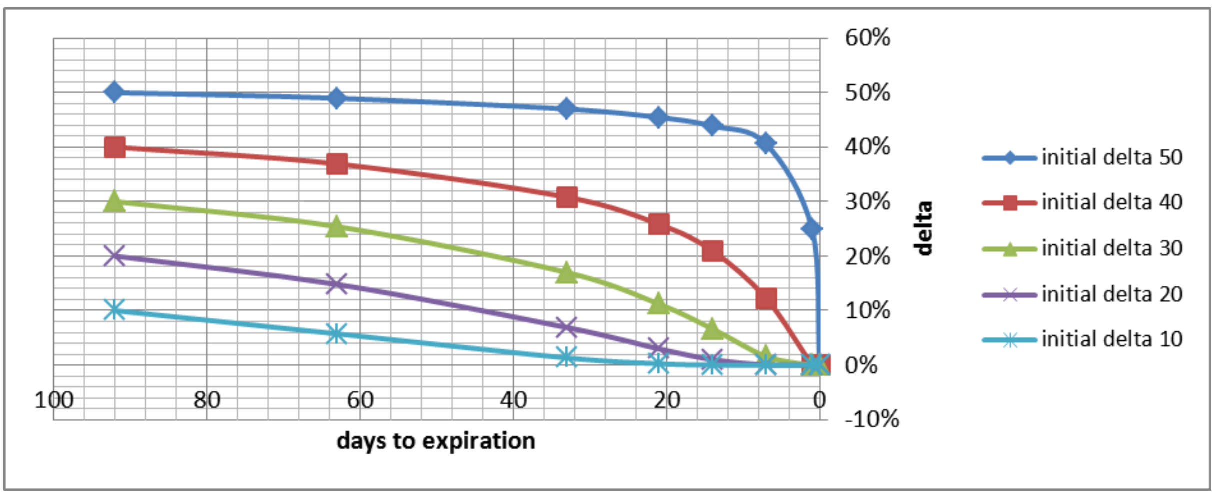
This makes intuitive sense because you can buy a larger face value of OTM options than of ATM options. For greater leverage (chance to make money), you pay *in absolute terms* more for the option (higher theta). Therefore, if you must choose between (a) buying $1 million face of an ATM option or $2 million face of a 25-delta option and (b) you are concerned with value preservation, you'll buy the former, forsaking the leverage of a $2 million position to preserve value.

Delta Behavior in Time of Options with Different Starting Deltas

Investors also must consider the delta / theta—the effect of time remaining to expiration on delta. Low-delta options shed delta quickly. Therefore, when the spot price of the underlying asset moves favorably, they don't gain in price much if you're a directional trader. We return to this point numerous times in the book.

Figure 2.3 shows, delta behavior of options priced at constant spot as option approaches expiration in a market in consolidation. This is a very important point to keep in mind when you try to manage interim P/L in expectation of a big move: only when this move happens will you see a positive result. Most small interim moves will barely compensate loss on time decay and on loss of the opportunity to make money caused by "damage" that time causes delta.

Figure 2.3
Delta Behavior of Options Priced at Constant Spot as They Approach Expiration



By the way, if you manage a delta-neutral options investment, you have the same problem: Low-delta options lose gamma together with reduction of delta—i.e., they almost stop reacting to local changes in the price of the underlying. Thus, you can't make money re-hedging. The same relates to high-delta options.

Theta Behavior of ITM and OTM Options

To make sure you have a functional rather than a theoretical grasp of put / call parity, let's apply it to the concept of theta. The theta of ITM and OTM options with identical expirations and strike prices should be the same. Let's review again the logic behind this statement. We'll start with a situation in which the interest curves are flat. In this case:

- As we discussed earlier concerning implied volatility, assuming both interest rates are equal 0 a delta-hedged option changes time value symmetrically in both directions if the underlying moves incrementally.

- Therefore, for instance, the delta-hedged 1.3000 USD call has the same risk / reward profile as the delta-hedged 1.3000 USD put.

  If the risk / reward of both positions is the same, you'd pay the same amount of *time value* for both options (although their prices will differ, because the ITM price includes intrinsic value).

- Since theta shows amortization of time value, thetas of both options will be the same.

One core principle of put / call parity is that options' prices should reflect their financing costs. In the ideal world, the lower the financing cost of the asset, the lower will be its forward price, because the forward price equals the price of the asset multiplied by its financing costs. In the same way, the higher the asset's yield, the lower will be the forward relative to its current price. This is simple to comprehend if you imagine holding a stock that announces a dividend. Since dividends reduce a company's balance sheet, its stock price declines, and an ATM call falls out of the money while an ATM put goes into the money—i.e., appreciates. In both cases, the lower the forward price, the closer to the current price is the strike of an ATM option.

For currencies, the formula of a foreign currency forward is

$$\text{Forward (USD / RUB)} = \text{Spot (USD / RUB)} \times (1+ r\,(\text{RUB}))^{t} / (1 + r\,(\text{USD}))^{t},$$

where the interest rate of RUB is the annualized (t) financing cost of the position, and the USD interest rate is the annualized yield of an asset.

From the FX forward formula you see that the higher the RUB interest rate, the higher will be the strikes of *ATM (forward) calls*. The opposite relation holds for the interest yield (or dividend in the case of stocks) of an asset (in this case USD). If you buy a call on a lower-yielding asset, you'll potentially have to finance the hedge at a higher rate until options expiration. However, the buyer of a put will accrue the benefits of that financing. To balance this inequality, the call's price will be smaller by the amount of the assumed financing losses, while the put's price will be greater by the amount of the assumed financing gain.

For instance, suppose interest rates available for rubles are higher than those available for dollars. To hedge a long OTM USD call / RUB put, you sell dollars and buy rubles. Since one asset (the dollar) yields less than its financing cost, the hedge loses on financing. Thus, the call's price should be less than the price of the puts. Therefore, its lesser time value will compensate for the financing losses. Respectively, theta for the calls will be greater than theta for the puts because the latter have a financing advantage. For example, when the price of a three-month 30-delta dollar call is 1.29%, a three-month dollar put with the same parameters will cost 1.38%.

Following this logic we would like to draw your attention to a common misrepresentation. The 50 delta option is not an ATM option. ATM forward options are the ones which make the put / call parity work—i.e. where the prices of the call, put and forward are aligned. The call and put may not be 50 delta options. That is why, for instance, strikes of 50 delta options move around with volatility while strikes of ATM forward options remain unchanged. The volatility component of time value of puts and calls are equally influenced by volatility.

Another caveat shows the interconnection of theta and volatility in practice. Options expiring on Monday lose a three-day amortization (the weekend and Monday). In other words, out of three calendar days, you can make money only during one business day. The price for such an option should reflect its lessened opportunity to make money. The lower price is achieved by lowering implied volatility. Hence, implied volatilities can differ markedly for short-term options expiring on Friday and the following Monday. Unless significant news is expected over a weekend, options expiring on Friday (or Tuesday) should be more expensive in both money and volatility terms than those expiring on Monday. Since volatility of Monday expiries are lower you pay for less idle time (the weekend). The volatility premium for options expiring on days other than Monday reflects their longer opportunity to make money.

Vega

Basic Characteristics of Vega

Vega measures the sensitivity of option prices to changes in volatility. Vega is expressed in percent or basis points. The price of an option with a vega of 0.04% will gain 0.04% if its volatility increases one percentage point. For instance, say you bought an option with a notional amount of $1 million for $1,000, and its vega is 0.0025%. If its volatility increases 1%, its price will be $1,025. The higher the option's vega, the greater its price change when implied volatility changes.

Behavior of Vega

Long-term options are relatively insensitive to changes in price of an underlying asset, and time decay of their prices is small (Table 2.3). However, their prices are highly responsive to changes in volatility. In absolute terms, their vega is higher than the vega of short-term options (i.e., ATM options with the same face value but different expirations).

The reverse is true for short-term options. Their prices are less sensitive to changes in volatility than prices of long-term options; in other words, their vega is smaller. Therefore, changes in volatility have a relatively minor impact on their prices.

Buyers of options benefit when volatility rises. Sellers of options ("vega sellers") benefit when volatility falls. A position that makes money when volatility increases is referred to as a *long vega position*. If the position loses money when volatility increases, it's called *short vega*. As with theta, ATM options have higher vega than ITM and OTM of the same notional.

Table 2.3 Vega of EUR / USD Options

Maturity / Delta	1 week	3 Week	3 Month	1 year
10%	+0.024%	+0.042%	+0.090%	+0.18%
30%	+0.048%	+0.084%	+0.18%	+0.36%
50%	+0.055%	+0.096%	+0.20%	+0.40%

In Table 2.3, you see that vega of one-month 30-delta options (% +0.048%) isn't significantly smaller than vega of 50-delta option (+0.055%). If you were to price these options (see Table 3.4. in the next section), you'd find that the price of the 50-delta option is almost double the price of the 30-delta option. In other, words if you want to invest a specific sum, you can buy twice as much of the 30-delta call than of a 50-delta call for each expiration. The vega of the 30-delta position also will be almost twice as large. Therefore, for the same investment, the 30-delta position will be more sensitive to volatility. This is an important point discussed in depth in Chapter 3.

Note that vega for ATM options of different periods is related through square root of time. The similarity with behavior of theta is not surprising given that vega is a major component of theta.

Other Shortcuts

Shortcut for Calculating Prices of OTM Options

While we're discussing useful shortcuts for figuring options prices, let's examine simplified calculations for options prices with similar expirations but different deltas (Table 2.4).

Table 2.4
Price Relationships for Two-month Options with Different Deltas

Cash (spot) Price	609	609	609
Delta	50%	30%	17%
Option Price	30.07	14.48	7.03

Table 2.4 helps in a *roughly* estimating option prices without computers. For instance, comparing options with identical expirations in Table 2.4, we see the price of the 50-delta option is about double that of the 30-delta option. The price of the latter is about double that of the option with 17-delta.

However, the table assumes identical volatility for options with different strikes within the same periods. For this reason you cannot take the relationships from Tables 2.2 and 2.4 and assume that the price of a one-month ATM option is equal to the price of a one-year 10-delta option. Nonetheless, for options with the same expiration, consulting these relationships may quicken your selection of an investing strategy.

Simplified Formula for Calculating ATM Option Prices

A formula based on the Black-Scholes methodology will help you calculate the price of an ATM option based on simplified assumptions.

The price on a European-style ATM option (with a flat forward curve) may be calculated as

$$\text{Price} = 0.4 \times \text{strike} \times \sqrt{(annualized\_time\_remaining\_until\_expiration)} \times V$$

where V is implied volatility and 0.4 is a coefficient which best serves the approximation.

Example: the strike price is 50, implied volatility is 14%, and time to expiration is 65 days. Then the option price will be $0.4 \times 50 \times \sqrt{65/365} \times 0.14 = 1.18$.

If you use this shortcut alongside the shortcut in Table 2.4, you can assume that the price of a 30-delta option will be approximately half of 1.18. Imagine how you'll impress your boss by calculating option prices in your head!

Q&A

Assuming a flat volatility curve:

Question: A one-year ATM call costs $100. What is the price of a one-month ATM call priced at the same volatility?

Answer: The price of a one-month ATM option is approximately half that of the three-month ATM option. It in turn is half the price of the one-year option. We can assume the one-month ATM call (or put) will cost $25.

Question: A three-month 30-delta call is $80. What is the price of one-week 30-delta put?

Answer: The price of a three-month ATM call is double that of the three-month 30-delta call ($160). Its price is about four times greater than a one-week ATM call ($40). The 30-delta put would cost half of that ($20). The forward differential doesn't influence the price of ATM options, but it changes the level of the ATM strike.

Question: How will the price of a three-month ATM call change if the price of the underlying drops from $80 to $40?

Answer: By exactly half as the price of the strike is directly proportional to the size of the price of an ATM option.

CHAPTER 3

RATIONAL USE AND CAPITAL PRESERVATION

Before making money, first learn how not to lose it. Directional investors need to know many details to use options advantageously. This chapter transforms the ideas from the previous chapter in a more actionable format. It covers many of the details and will help you to minimize several obvious mistakes while providing the background for a knowledgeable approach to options. By pointing out general market-related principles and focusing on optimization of options' risk parameters ("Greeks"), this chapter gives you an edge. This material will be valuable for investors concerned with capital preservation.

Market-makers and Spreads

You probably realize that opening and closing positions in options in relative terms costs more than in the underlying security in the cash / spot[19] market. That's because option prices include three price spreads. You implicitly pay a spread to the cash / spot market-maker, the spread required by forward / REPO market-maker, and an option's (volatility's) market-maker's spread. All these spreads are a part of the option's price when you buy or sell. For this reason, reversing mistakes that result from using options, especially unlisted options, is more expensive than reversing mistakes with other instruments.

Table 3.1
Breakeven Points for One-week EUR Calls (USD Puts)
with Various Deltas (Price assumes the EUR / USD spot price = 1.2630.)

Delta	**Strike**	**Option Price (USD pips)**		**Spread as % of Call's Price ((Offer-Bid) / Bid)**	**Change in Spot Price Needed to Offset Bid / Offer Spread**
		Bid	**Offer**		
10%	1.3055	0.0012	0.0014	17%	0.0020
30%	1.2800	0.0061	0.0064	5%	0.0007
60%	1.2600	0.0143	0.0146	2%	0.0001

Figure assumes options are purchased and sold back immediately.

Refer to line 1 in Table 3.1. Say that the bid-offer spread for the EUR / USD call with a strike price of 1.3055 is 0.0002—i.e., (0.0014 − 0.0012). If you sold the call and bought it back immediately, the spread corresponds to approximately 17% of the call's price ((0.0014 − 0.0012) / 0.0012)) = 0.1666). In other words, when you buy the option, 14% of your investment effectively covers the bid / offer spread. You can think of it as being 20% (17% / 83%) more difficult to make money on this investment than on a spot trade where the market maker spread is negligible.

Observation 1: A market-maker's spread as a percentage of capital—i.e., the initial cost of opening an options position—increases as delta falls.

For options for which a single stock is the underlying asset, delta is less frequently used to describe an option's characteristics. Instead, investors refer to its *moneyness*: the relationship of the strike prices to the current price of the underlying asset.[20] For example, the strike price of an option that's 110% ITM is calculated from the current cash price. However, options are priced and hedged based on delta as well. That's why the relationship of bid-offer spreads in the case of *moneyness* is the same in the case of delta. Since options concepts are easier to explain using delta, we rarely use moneyness.

Let's calculate how much the price of the underlying asset must move in a favorable direction to overcome the bid-offer spread, thereby allowing you to exit at the price paid (Table 3.1, last column). First, recall the definition of delta: the change in an option's price following a price change in the underlying asset. Hence, the price of an option with 10 delta will increase by one basis point (bp or pip) for each change of 10 pips in the underlying asset. The price of a 30-delta option will change 1 pip per change of 3.3 pips in price of the underlying.

Therefore, to overcome the bid-offer spread of the three options the spot must move 0.0020 (20 pips) for a 10-delta option and only about 0.0002 (2 pips) for a 60-delta option. This analysis leads to our second observation:

Observation 2: The lower the delta, the greater the required change in price of the underlying asset to overcome the market-maker's spread.

The conclusion from a capital preservation perspective is that the smaller the proportion of spread you pay to market-makers, the better may be your strategy. Therefore, options slightly ITM are preferable when all other variables are constant. They're particularly preferable in illiquid markets where bid-offer spreads of lower-delta options can be 50% to 100% of the bid price. We return often to this conclusion when we study strategies for protecting option positions.

Observations about Theta

Let's discuss some practical implications of theta. You'll remember that theta is the amount an option's price declines in value each day. Table 3.2 shows that options with lower deltas have relatively *greater* daily *capital* loss. Stated another way, the theta of an OTM option as a percentage of its price is much higher than that of options closer to being at the money.

Observation 3: Theta constitutes a greater portion of capital for lower-delta options at the time the positions are initiated.

Table 3.2
Theta Breakeven Points for the First Day of One-month EUR Calls (USD Puts) with Various Deltas (Price assumes the EUR / USD spot price = 1.2630.)

Delta	Strike	Offer Price (USD pips)	Theta on the First Day	Theta as % of Price	Change in Spot Price Required to Offset Theta
10%	1.3055	0.0014	0.0009	6%	0.0009
30%	1.2800	0.0064	0.00019	3%	0.0006
60%	1.2600	0.0146	0.00021	1.5%	0.0002

Table 3.2 also demonstrates that…

Observation 4: The lower an option's delta, the greater is the spot move required to cover theta.

Observation 5: We emphasize again the square root of the annualized time-to-expiration function is related to theta only for ATM options. Recall that Figure 2.2 in the previous chapter demonstrated that the speed at which an OTM or ITM option loses time value differs from that of an ATM option.

Observation 6: During the early period of owning an option with a distant expiration date, amortization in the price of a long-term option (theta) is a small portion of its premium and does not cause a noticeable capital loss. Even beginners know that, but internalizing this point will reduce your *fear of buying long-term options*. Eight-month ATM options will lose almost half their price during the two months before expiration.[21] In fact, even one-month ATM options will lose only approximately half of their price in the first three weeks if the underlying remains at the original level.

The clear conclusion is that managing theta is important for optimizing capital.

Observations about Gamma

Lower-delta options over time lose delta faster than higher-delta options, as Figure 2.3 showed. However, the lower the delta, the smaller is gamma. Therefore, over time if the price of the underlying asset remains stable, lower-delta options shed delta and gamma and, consequently, opportunity to benefit from directional moves of the underlying. Hence….

Observation 7: The farther the option's strike is from the price of the underlying asset (i.e., the farther delta is from 50 in either direction), the faster the option loses not only time value (as a proportion of capital) but, no less important, *profit potential*.

Table 2.2 also illustrated that price changes for options with any delta are nonlinear. Table 2.2 indicated that the price of an ATM option nearly doubles when time to expiration extends from one week to one month, from one month to three months, and from three months to one year. The same proportions pertain to vega (Table 2.3), and the reverse is true for gamma, because gamma is practically a reverse from theta (see Table 3.3). Especially take a look at the correspondence of prices and vega for different periods.

Table 3.3 Prices and Greeks of ATM EUR calls/USD puts

Expiration	**1 Month**	**3 Months**	**1 Year**
Price (USD pips)	0.0117	0.0210	0.0461
Vega (USD pips)	0.0014	0.0025	0.0050
Theta (USD pips)	0.0002	0.0001	0.0001
Gamma (USD pips)	13.84	7.71	3.50

In a way, this observation answers those who, after reading the previous observations, wonder if it's possible to find an option inherently more valuable because of its combination of "Greeks." To save you from vain searches for a way to arbitrage among "Greeks," consider ….

Observation 8: There's no single combination of "Greeks" that is clearly more advantageous than others that cost the same—i.e. given the same price, you must decide which "Greeks" are more important for you for the price you're prepared to pay.

For instance, in comparing ATM options with different expirations on the same underlying asset, investors want an option with higher gamma and lower theta for a given investment compared to options with the same theta or gamma. However, such arbitrage is unlikely.

The conclusion of this lesson is: don't look for freebies. Take the absence of arbitrage as given and optimize your positions in line with the position objective and "natural" features of "Greeks."

Observations about Vega

Let's discuss vega, which measures the sensitivity of option prices to changes in implied volatility. Table 3.4 shows that the price of a 10-delta option rises 6.3 points if implied volatility increases from 9 to 10. A 6.3-point increase in option price for a one-point increase in implied volatility constitutes a 45% increase in an option's price!

Table 3.4
Effect of Change in Implied Volatility on Option Price of
1-month EUR calls / USD puts
(Price assumes EUR / USD spot price = 1.2630.)

Delta	**Strikes**	**Price (USD pips)**[22]	**Vega (USD pips)**	**An expected change in the price due to vega as % of the price**
10%	1.3055	0.0014	0.00063	45%
30%	1.2800	0.0064	0.00187	29%

Observation 9: Lower-delta OTM (and high-delta ITM) options show less absolute sensitivity to changes in implied volatility than ATM options.[23] However, capital is more sensitive to changes in vega for options far out of the money. To put it differently, *for two options that represent investments of equal size, the ATM options position will be smaller, and the investment will be less sensitive to vega.*

Many directional investors discover that their option position lost money even though they had the correct directional view. That happens if the price moves in your direction, but implied volatility moves against you, for the result is no net price change even if you correctly forecast the price change of the underlying. Note that based on the numbers in Table 3.4 it will take approximately a 63 pip (0.5%) move of EUR / USD for a one-month 10 delta option to equate to the change in price caused by a 1% change in volatility. In other words, the impact of volatility changes on prices of even short-dated low-delta options is comparable to that of directional moves.

Observation 10: This is very important! Low-delta options may have similar sensitivities to significant moves in the underlying asset and *insignificant* changes in implied volatility.

All told, as an investor concerned with capital preservation, you should be beginning to realize that OTM options are not that conservative. *OTM options not only are less likely to be exercised, but they also remain extremely expensive in every sense*.

In analyzing how a volatility change influences an option's price (Table 3.5), note that vega of ATM options of a given expiration does not change when volatilities change.

Table 3.5
Vega (% of EUR notional) of ATM Options
with Differing Times to Expiration at Differing Implied Volatilities

Expiries in Volatility	1 Month	3 Months	1 Year
10%	0.11%	0.2%	0.4%
30%	0.11%	0.2%	0.4%

That is, although there are exceptions, in general a change in vega causes the same change in an option's price, notwithstanding the level of volatility from which this change occurs. This relationship is not typical for options where parameters tend to have curvilinear relationships. As Table 2.3 demonstrated, the price of a 30%

option is generally half that of an ATM option, whereas their vegas different little. Were you to play with the numbers further you would see that the price differential between options priced at 50 and 30 volatilities (within identical expiration) is almost the same as that of options priced at volatilities of 30 and 10, respectively.

Observation 11: Table 3.5 shows that vega of ATM options of different expirations like their price is related via the annualized time function $\sqrt{t}$.

One advantage of reviewing the previous and current chapters is to reach some conclusions for structuring medium-term and long-term option positions. The following final two reminders are important.

Recommendations for Short-term Investing

As in the case of theta, the vega of options with the *same notional* value is greater for ATM options than for OTM and ITM options. However, even more obvious than in the case of theta, if you compare the influence of vega on *capital* invested in ATM or OTM options, you see that the vega of the OTM *investment* will be greater.

To increase the likelihood of making money:

- Buy short-term low, delta options only when you expect a move to occur relatively soon (in relation to the time to expiration). That choice is even more advisable if you expect implied volatility to increase.

- If you expect a breakout of a range after long period of sideways price moves, reduce the potential loss of capital caused by the bid-offer spread by using ATM options. They are still better than OTMs because should the sideways move continue, you will have greater loss of both capital and opportunity to make money with OTM options.

- If you want to collect the premium by selling options, it's safer to sell OTM lower-delta options. The gain on their theta will hedge against the loss on an unexpected adverse move of the underlying. In other words, the underlying instrument needs to change significantly in favor of the buyer to create a loss to the seller.

Recommendations for Medium-term and Long-term Investing

As an investor interested in longer time horizons, remember the following points:

When selling *long-term* options, remember that if volatilities are stable, their risk / reward profiles resemble those of the underlying cash / spot in the delta-equivalent amount: They lose *time value* slowly, and they have small gamma. Consequently, their option price changes is almost equivalent to a change of the underlying position equivalent to the option's delta.

Therefore, don't focus on the likely time decay loss of your investment when you deal with longer-dated options. In fact, its size is not that important. Since the theta of options with a lengthy term to expiration is minimal, the daily loss of value due to time decay is minimal. Remember that it takes six months for an eight-month ATM option to lose half of its value, even if there's no move by the underlying! This is an important point in conjunction with the observation that we tend to be overoptimistic about timing of events. In particular, investors generally expect moves to occur earlier than they normally occur. Hence the next chapters will recommend buying options with expirations that exceed your expected time horizon. To feel comfortable with this recommendation you must remember this by-now-obvious observation.

Changes in their time value likely won't compensate changes in volatility. Therefore, changes due to vega have the greatest impact of other "Greeks" imbedded in option prices.

If you're unsure about forecasting implied volatility, avoid long-term options, or at least avoid unhedged OTM long-term options.

Questions & Answers

This chapter addresses several of the frequently asked practical questions that follow. If they seem difficult, review the material again. Questions 4 and 5 probably are more difficult, as they relate more to market-makers and investors specializing in volatility arbitrage. As mentioned, they have a slightly different approach to managing option positions.

Question: You're concerned about risks inherent in large volatility exposure of your position. To minimize it, should you prefer long-term or short-term options?

Answer: Long-term options are more sensitive to changes in implied volatility. To reduce volatility risk, use longer-dated options.

Question: You are long gamma risk—i.e. your position should quickly change value if price of the underlying asset moves around. To neutralize it, should you sell / buy a long-term or a short-term option?

Answer: If your position changes value with changes in the underlying asset, you need to neutralize its gamma. Near-term options have higher gamma than longer-term options. To reduce long gamma risk sell short-dated options. You would sell such options when your position loses a lot of time value, as higher position gamma corresponds to higher time decay.

Question: Your position loses time value uncomfortably fast. What does it say about your overall options position, if the underlying price and volatility are steady?

*Answe*r: You have a long option position in an option with relatively short expiries. Its theta is negative (you lose money). To reduce this risk, sell a short-term option to offset the time loss of the current position. You perhaps noticed that Question 3 is the same as Question 2.

For practice at arbitraging volatility, (i.e., running delta-neutral positions), consider the following questions. They assume you sold a one-month ATM straddle and bought a six-month ATM straddle for the same price.

Question: What is your position in terms of gamma and vega?

Answer: Your position is short gamma because the near-term option has higher gamma, and it is long vega because the six-month option is more sensitive to changes in implied volatility than the near term option.

Question: Is the theta of your position positive or negative, or are you gaining or losing from theta?

Answer: Near-term options have greater negative theta than longer-term options. Since you are short the short term option, you will benefit from time decay.

Question: Do you expect the position to be profitable if the price of the underlying asset changes substantially, but volatility remains stable (without considering theta)?

Answer: You will lose money because you are short gamma, and the price of near-term options will change faster than the price of long-term options.

Question: Do you expect the position to be profitable if implied volatility is increasing along the entire volatility curve—i.e. makes a parallel shift upward?

Answer: Since the position is long vega, you make money. Long options are more sensitive to changes in implied volatility. You make more on the long position than you lose on the short-term position unless the increase in implied volatility corresponds to a significant increase in historical (realized) volatility. In such situations, you may lose more on short gamma than you gain on long vega.

Consider the following situation. The price of the underlying asset is increasing slowly. You want to buy an OTM call and finance it by selling an OTM put.

Question: How would a continuing advance in the price of the underlying and implied volatility influence your gain or loss if your expectations materialize?

Answer: As long as the price of the underlying increases, the gamma of the sold put will decrease while gamma of the long call will increase; As a result, your net long gamma position will also increase. The same is true for vega, although the effect will be less noticeable. Meanwhile, as the underlying price rises there is less uncertainty about the direction, so implied volatility will decline. Therefore, as your position becomes more positive in terms of vega and gamma while volatility decreases you start losing on vega as well as theta.

Question: The price of the underlying has been rising for a long time. What should be more expensive to buy in terms of the implied volatility: calls or puts?

Answer: Although implied volatility generally will decline with the advance, the demand for puts will keep them better bid as investors begin seeking protection from a downturn. At the same time, call selling will increase, adding downward pressure on call-implied volatility. If the price of the underlying asset stalls and begins to decline, demand for puts will increase implied volatility across the curve, but the prices of puts will rise faster.

CHAPTER 4
The Other Side of the Market: How Market-Makers Manage Positions

Some investors assume that market makers have advantaged insights into the market's direction. That assumption leads them to believe that market makers' willingness to sell options means they're overpriced and their willingness to buy options means their price is too low. People persist in these beliefs even when trading on options exchanges, where prices are more transparent than on the interbank market. Sometimes those worries are justified, but most of the time they can be dissipated by understanding how market-makers manage their positions. That understanding is the goal of this chapter.

What Directional Investors Should Know about Market-Makers

Why Investors Aren't Prey for Market-Makers

Non-professional investors often worry that the volatility implied in an option's current price leaves little opportunity for profit. Before adopting their worries, however, think about the prices of any asset class that you routinely buy or sell. According to the efficient markets hypothesis, after all, any current price for a stock or a bond should be the "correct price," leaving no possibility for profit above the average return of the market! You probably have no qualms about trading stocks that theoretically are fully priced; likewise there's no reason to fabricate fears about option pricing.

Determining Bid and Asked Prices

Market-makers set their prices by first estimating the range of market fluctuations they expect for the underlying asset during the period the option is active. Then they apply individual assessments to hedge their assumed price risk. Let's revisit an earlier example. Suppose an options market-maker expects the price of an underlying asset, say the EUR / USD, to fluctuate within a 125-pip range, and the current (i.e., spot) price of the EUR / USD is 1.2500. This being the case, the daily implied volatility is 16% [(0.0125 / 1.2500) x 16 = 0.16].

It's important to distinguish between intraday volatility and the maximum daily range. If the spot price makes many moves back and forth between the range of 1.2500 − 1.2625 (the 0.0125 from above), you can say that intraday volatility was high, and the overall forecast of the range turned out to be correct. This forecast may be correct even if the market didn't make several turns inside the range—i.e., intraday volatility was low. As you imagine, an options market-maker prefers to pay different prices for these scenarios of intraday volatility even though the range is the same. Of course, he rarely knows market behavior far in advance. All he can do is adjust his views based on recent experience.

In the case of high intraday volatility, every time the spot price changed direction the market-maker who sold an option had to figure out if the spot would continue moving in that direction. If he was uncertain about his answer, he'd have to re-hedge the sold option. For instance, if he sold a 1.2500 EUR call, every time the spot rose toward 1.2625 he'd have to buy it so his appreciated spot position would hedge the appreciated short option. However, then the spot price turns in the opposite direction. The option's value would decline, and so he didn't need as much hedging. Therefore, he'd sell the extra hedge at around 1.2500. Even if he guessed the range correctly, he'd lose money because he failed to predict intraday volatility.

Pricing in Volatile Markets

Let's look at how the options market-maker considers the volatility price he's willing to pay for the option. He realizes that he won't always buy or sell the underlying currency at the day's highest or lowest price. At best during one day he'd sell "close" to the high and buy "close" to the low. Besides, he doesn't know how great will be the intraday volatility—i.e., how many times he'll be able to execute the turns of buying low and selling high. Accordingly, perhaps he'll take advantage of 60% of the expected daily range to determine his bid and asked prices. This calculation results in an implied volatility bid of 9.6% (0.0125 x 60% / 1.2500) x 16 = 0.096 or 9.6%, with an implied volatility offer at 16%.

If market direction is unclear, the market-maker's offered price will be high because he's nervous about guessing the direction correctly and mis-timing his hedges.[24]

Let's assume our market-maker who sold the call expects the market for the underlying asset to move generally in one direction. Once he guesses the direction, he deliberately over-hedges the option. For instance, if he expects the euro to strengthen, he buys more spot EUR / USD (the underlying asset) than is required by the model's delta (the hedge ratio). Even if he expects high intraday volatility, he doesn't re-hedge, for during a bullish trend he expects the market to close higher at the end of the next day.

Besides, intraday high / low ranges tend to be significantly wider than the distance between the closing prices of the underlying assets. Because closing prices are less volatile than intraday highs and lows, the market-maker who sold an option might anticipate smaller possible losses on his underlying position and hedge only once daily at closing. In this case, his offered price will be lower. In a nutshell, the market-maker's hedging assumptions determine what bid-asked spread he will quote and how he will alter it.

Considerations for Directional Investors

Here's how this logic relates to directional investors. If the trend is clear, the investor will make money on the bullish trend, and the market-maker will make money on his hedging strategy. If the trend is unclear, both can lose money.

If, after this explanation, you're still worried about market-makers taking advantage of you, here's a second argument. When we discussed put / call parity, we saw that option prices almost never reflect the market-maker's directional view.[25] What matters to market-makers is implied volatility. When they hedge, they assume that a 20-delta put and 20-delta call have similar prospects of being in the money, and they hedge their positions accordingly.

Even so, some investors respond that "volatility skews" suggest some directional slant. This may be partially true, but skews primarily reflect liquidity. With S&P 500 index options, for instance, OTM puts almost always trade at higher volatilities than OTM calls because there are more buyers for puts (hedging long positions in stocks) and sellers of the calls. Thus, if investors are happy to buy call options based on their view of the market's direction, market-makers are happy to sell them without a skew based on their forecasts of market volatility (price fluctuation) and demand for calls. As you see, investors' and market-makers' views don't coincide.

Third argument. As noted, dealers buy and sell hedged options—i.e., they trade the volatility. As we mentioned, interbank market-makers generally price to each other in volatility terms. In our example, the price of the 1.2500 EUR call /

USD put is 9.6% bid and 16% offer in volatility terms. That's what the market-maker would quote, rather than $1 at $2 per €1 million of the option's notional value.

As we know, if a given stock is in demand, its price can exceed its fundamental value if there are no sellers. In other words, as with prices of any traded asset, options volatility is subject to the liquidity available in the options market. Demand and supply for options translates into price changes that are expressed in their implied volatility. As a result, a market-maker may have his personal implied volatility forecast (i.e. forecast of hedgeable ranges), but he sets volatility prices based on the reality that a single large client has just "lifted size" (purchased big size option position with a single strike price or a few big size options at the same time). Thereafter, prices in implied volatilities may differ substantially from the hedging assumptions of implied volatility because they reflect market liquidity—i.e., the fact that market-makers are now short and pay a higher price or sell at a higher price in volatility terms.

Let's conclude this section with some reassurance: options market-makers don't as a routine matter take you for a bigger ride than market-makers in other assets. Or put another way, because of differences in how market-makers and directional investors value opportunities, non-derivative investors should assume that market-makers don't price "correctly" the chance that an option will be in the money in the direction that investors believe the market is moving.

Understanding Market-Makers' (Delta-Neutral) Portfolios

The suspicion that market-makers are taking advantage of investors may arise from inadequate understanding of how market-makers manage their "book." So let's consider what market-makers are thinking before we blame them for "reading things his way" or adjusting the option's price based on anticipating the client's side of the trade.

Investors who trade stocks and bonds know that market-makers in those assets constantly adjust their positions. Yet those same investors may believe options market-makers behave differently and receive all the money that investors lose. In fact, options market-makers seldom hold positions to expiration. Hence, the money an investor lost by selling an option doesn't represent an equivalent gain for the market-maker who bought it, for he might have sold an option back into the market almost immediately.

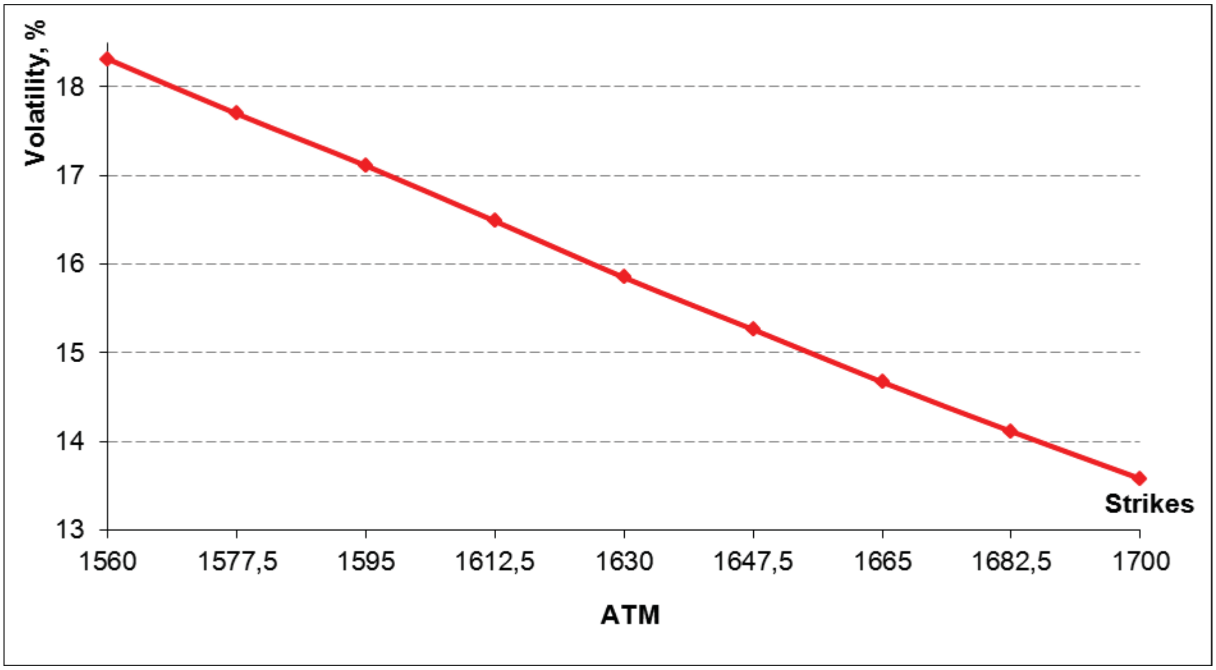
The second point is that options market-makers revalue their portfolios to the market, as do market-makers in other assets. The technical difference is that they don't look at the absolute level of prices (in volatilities). Rather, they evaluate an option's price against a benchmark of volatility. If absolute volatility is high, market-makers don't necessarily earn more money than when it's low. Whether volatility is high or low, the result for the market-maker is an increment based on a benchmark, not the absolute level of the market prices themselves. The same happens with market-makers in equities. If, for instance, they own a share priced at $600 that they bought for $597, their profit is $3. If they own a share at $90 and it's currently trading at $100, their profit is $10. Their profit isn't a function of the market level alone.

Options market-makers reevaluate their portfolios using methods designed to accommodate combinations of options, and those methods are more complex than methods used by intermediaries in the spot and cash markets for underlying assets. Options market-makers usually revalue their portfolios (mark them to market) based on the complex benchmarks of volatility curves and skews. Just to remind, an ATM volatility curve is formed by mapping implied volatilities of ATM option prices with different expirations. Sometimes this graph is called a *volatility term curve* or a *term skew.*

Skews in Option Prices

Figure 4.1 shows option skews. It depicts options prices that reflect a premium or discount skewed for volatility of OTM and ITM options, and it compares them to volatility in ATM options with the same expirations. The rule of thumb is that options command a volatility premium when their strike prices lie in the path that a volatile market is moving. In the case of options on the S&P 500 index, the path of the underlying asset favors puts.

Figure 4.1
Skew Curve of Three-month S&P 500 Index Options



Source: Bloomberg

As mentioned, in the case of the S&P 500 Index, volatility spikes when markets fall. For this reason, OTM puts (for example, three-month 30-delta SPX puts) trade at an implied volatility of 18.15%, higher than ATM puts with an implied volatility of 15.9%. In dollars, the skew means the price of the 30-delta put under an implied volatility of 18.1% will cost 1.92% of the underlying price, and at 15.9% its price is 1.53%. That 3.25% additional volatility premium (18.15% − 15.9%) translates into a skew premium of 0.39% (1.92% − 1.53%).

Constructing the Market-Maker's Portfolio

Options market-makers construct portfolios by buying and selling options and hedging them with the underlying asset or with other options. Those options don't necessarily expire on the same dates as the options they're hedging. How then do market-makers value their portfolios comprised of many seemingly unrelated options? They observe a volatility curve that's based on volatility of ATM options with different expirations. This curve serves as a benchmark for evaluating non-ATM options.[26]

Market-makers check to see which options are relatively cheap or expensive in reference to their implied volatility from the perspective of this ATM volatility curve. To do so, they compare the implied volatilities of options with different deltas with ATM volatility for all expirations.[27] If OTM options sell at a higher volatility than ATM options, they earn a "theoretical" profit equal to the differential, which in our example above was 0.39%. Just as with underlying asset prices, volatility curve, skews, and funding rates change constantly. The theoretical value[28] of the market-maker's portfolio changes as well.

The discussion above explains why many market-makers prefer selling OTM options and hedging them with ATM options: they pick up a slight premium over the ATM curve. The discussion above also indicates why market-makers tend *not* to care which specific option they sell or buy. Contrary to what investors suspect, market-makers probably have no source where they can buy the same option cheaper. After selling the option to an investor, a market-maker probably buys a different "cheaper" option (in volatility terms). That option may expire at a different time, have another delta, or be another type of option (selling a call to hedge a purchased put).

Market-making in Illiquid Markets and by Private Banks

Everything we've discussed so far is relevant for highly liquid markets, but illiquid market conditions are a different matter. During illiquid markets, market-makers often show wide spreads between bid and asked prices. Wide spreads give the appearance that market-makers are ripping clients off, especially compared to spreads during quiet markets. However, in a way it is the reflection of their costs: when markets move, hedging becomes a significant problem. Most of the spreads earned during quiet times are lost during volatile times. In other words, wide spreads generally reflect the premium for illiquidity.

Unfortunately, investors who trade options through their banks as private clients do face unjustifiably wide spreads. This is the general case if you customarily deal only with one market-maker, and you should be cautious about spreads. Even in this case, however, spreads will be set according to a benchmark, not according to a desire to "participate" in your trading profits.

PART 2
TRADING PSYCHOLOGY THROUGH THE PRISM OF BEHAVIORAL FINANCE

Notwithstanding advances in financial and informational technologies, 21st century investors differ little from their predecessors psychologically. All investors enjoy days when we're pleased with our wiser half. Then one day our trading screens show us our dumber half, and we make a highly emotional commitment to that picture. We spend a great deal of time listening as conflicting images of ourselves argue. Understanding and managing your personal psychology is difficult but essential to investing. You can gain considerable advantage by having better sources of information and advanced abilities to analyze it. But without psychological insight, it's hard to benefit consistently from even your most accurate market insights. This part of the book will help you become a better arbiter of yourself and of what's driving the market.

CHAPTER 5
Psychological Issues of Trading and Decision making

If you know senior business executives, you realize that the most successful understand their personal risk profiles, which is essential to their ability to judge complex situations. You must know your personal psychology and develop systems of self-control. Otherwise, in the long-run even the most effective ability to analyze markets is unlikely to achieve consistent results.

Basics of Decision–making

Decision-making is a dynamic activity with emotional, informational, and contradictory components. There's abundant literature on this subject, but investors rarely delve into this subject because little of it ties to trading. We'll try to bring a few ideas from the field in a top-down way.

The first step is to understand the decision-making process in its totality. Shefrin and Thaler[29] suggest that decisions are composed of planning and acting. As they see it, planning defines and limits the steps in taking correct action. The most effective steps are simple, easily defined, rarely change, and seldom permit exceptions. But having self-control is essential to following the pre-set plan and taking the effective steps.

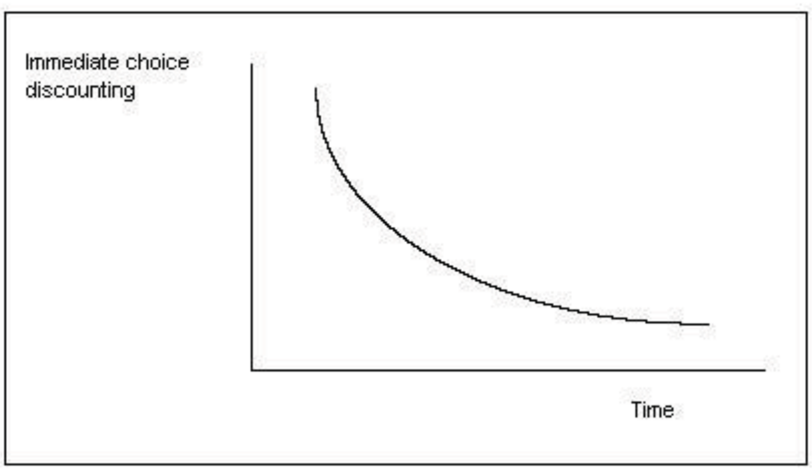
For instance, a relatively simple approach to the market is critical, because it's controllable. Investors often see the strategic advantage in a building complex ("sophisticated") understanding of markets. That's fine, but when they build *multifactor models*, they *lose ability to control* their positions because the factors they consider send conflicting signals. Since one factor seldom changes, changes in a simple scenario are easier to control. Why is this simple idea difficult to implement? Because skill at figuring out the primary drivers in any market doesn't come easy. Hence we're forced to react too many factors, and in doing so we subject our successful strategy to execution risks.

To manage better we need self-control—i.e., follow the original plan up to the moment we decide it's doomed. In the process, we must evaluate the impact of all the different events on our original strategy. McIntosh[30] said "The idea of self-control is paradoxical unless it is assumed that the psyche contains more than one energy system, and that these energy systems have some degree of independence from each other." In other words, an investor, like a corporation, should make decisions and control their execution. This is rather self-evident, but what issues must we control to become more efficient? There are many, and we'll discuss some in the following chapters. This chapter discusses the emotional consistency of our preferences in time.

Discount Function

Strotz[31] explained one of the key problems of self-control with a help of a discount function[32] in which short-term satisfaction presides over long-term satisfaction (Figure 5.1). Despite wishing to be slim, for example, people overeat because they like to eat. They subordinate long-term goals to immediate gratification. In investing and life, we react to announcements, events, information, or our own discoveries. Some create urges to act. Many lead to irrational decisions. The figure shows that by relocating a decision away from the immediate moment we can manage our personal psychologies.[33]

Figure 5.1
Strotz's Discount Utility Function



This function demonstrates how time distorts decision-making—namely, our urge to act is most intense immediately after the onset of a stimulus and dissipates with time. The urge to act immediately is exacerbated by the tendency of behavior to be irrational when our objectives are discontinuous or inconsistent. McIntosh[34] defined *discontinuity* as changing goals over time and *inconsistency* as a conflict between goals at a particular moment. This is something relevant to trading, where our thinking is characterized by both discontinuity and inconsistency.

Like Shefrin and Thaler, Strotz emphasized the importance of establishing a plan to limit event-induced irrationality. He wrote:

> If an individual doesn't discount all future pleasures at a constant rate of interest, he finds himself continuously repudiating his past plans and may learn to distrust his future behavior, and may do something about it. Two kinds of action are possible. (1) He may try to precommit his future activities either irrevocably or by contriving a penalty for his future self if he should misbehave. This we call the *strategy of precommitment*. (2) He may resign himself to the fact of intertemporal conflict and decide that his "optimal" plan at any date is a will-o'-the-wisp which cannot be attained, and learn to select the present action which will be best in the light of future disobedience. This we call the *strategy of consistent planning*.[35]

An episode from the *Odyssey* reveals a classic example of preliminary planning. Headed home, the ship of Odysseus had to pass the island inhabited by the Sirens. It was known that the Sirens lured sailors with their enchanting music and voices, causing shipwrecked on the reefs around their island. To prevent that temptation as his ship approached the dangerous waters, Odysseus poured wax into his crew's ears and ordered himself tied to the mast.

Many finance books explain how to adjust expectations following new information. However, few books explore the emotional changes that occur when the new information arrives, as many investors experience losses even when they had the right views because they were distracted, mislead, or scared at the decisive moment. To be successful in this endeavor you must not only devise investment strategies but also envision and plan reactions to setbacks. We'll discuss more about these skills as we discuss strategies.

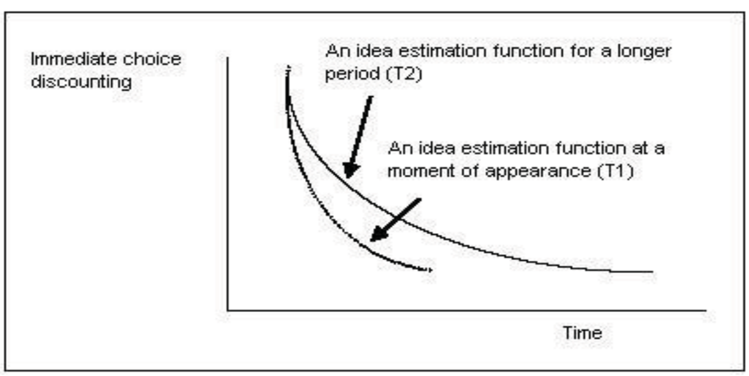
How do *you* fight temptation? Like Odysseus, you can construct strategies to mitigate irrational impulses. For instance, you might use pre-defined stops. Another way to reduce dependence on emotions is to ask, "What will I say about today's outlook a year from now?" "If I do a trade, will in a year I consider this trade to be the best trade of my life?" These questions help to put today's market into perspective while mitigating effects of emotional momentum on long-term decision-making.

When you plan, respect your previous achievements and failures. Suppose intuition urges you to buy a short-term option, but you realize that your previous timing of breakouts was too optimistic. In this instance, correct your intuition by choosing a longer-dated option. Risk-management methods such as limiting position sizes are widely practiced to prevent catastrophic failures.

One step in planning is to reset trading objectives regularly. Experienced traders recommend starting each day by asking, "What's the ideal portfolio I'd like to have today?" Then they make the implied changes to the portfolio they have. On its surface, this trick creates discontinuity with previous decisions, but in practice you're effectively marking-to-market your views and making changes in a thoughtful, consistent manner rather than waking up one morning to confront a market event and deciding to change everything at once.

Figures 5.2 and 5.3 illustrate how urgency diminishes if investors give themselves time to reflect. Figure 5.2 illustrates that our initial impulses are more emotional and may prompt irrational actions, shown graphically. Hasty decisions assure there's less time to develop a control plan.

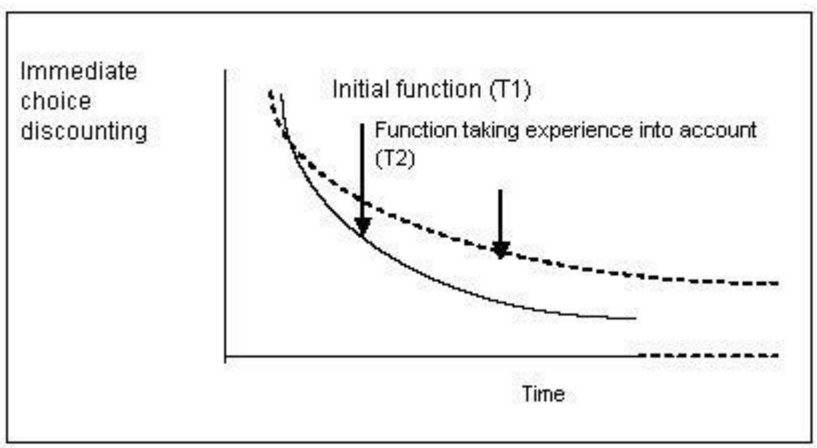
Figure 5.2
Discount Function at the Origination of an Idea



In imagining your own discount function, keep in mind that it will be influenced by recent events. After big losses, you'll often decide the market's positive prospects are distant, just as you'll expect good times to continue when things are going well. In other words, the function is asymmetrical for follow-up positive and negative situations.

One more observation completes the function indicated in Figure 5.3. Compare your own behavior when you were younger and as you aged. At age 15, your entire future seemingly depended on resolving a problem that seemed urgent at the time. Later, that problem seemed insignificant as you overcame greater challenges. Life experience changed the function's shape. Trading experience produces the same result and hopefully your ability of self-control improves with time.

Figure 5.3
Discount Function for Experience



Some investors find psychological discussions boring and take up yoga to curb their emotions. They practice the pose of sphinx, then the lotus position … some curl their legs behind their ears. That pose seems awkward and unwise: what if your broker calls? If your feet are covering your ears, how will you hear the phone! If you prefer yoga to bookish advice, at least calm yourself in ergonomically advantaged positions.

Cognitive Dissonance

Although experience helps, it doesn't help as fast as we'd like because our subconscious blocks portions of it. In 1957, Ferstinger introduced his Theory of Cognitive Dissonance, the essence of which is that our subconscious modifies earlier actions and beliefs after the fact. In particular, it may mitigate your pain of loss and reduce your incentive to avoid the particular matter that caused mistakes in the past. For instance, an investor whose decision produced a loss may justify his failure by blaming advice he actually didn't receive or "misunderstood." As Ferstinger explains, our subconscious resolves contradictions by "reconstructing" history to avoid internal conflict and fit desired outcome. In doing so, our conscious mind believes the version of our unconscious mind. Unintentionally, we deceive ourselves.

Furthermore, cognitive dissonance argues that we're irrational in a particular kind of way. Namely, when we're faced with two mutually exclusive ideas or evidence that contradicts a belief, we rationalize the contradiction in ways that preserve our belief. My belief that I am a wise investor who makes good decisions is contradicted by evidence of a really poor decision. Therefore, I rationalize that the market is unjustifiably erratic or I had poor advice or some other circumstance intruded to render the outcome something other than my fault. In essence, our reaction is self-deluding.

Cognitive dissonance is especially active after we've exercised poor judgment. Its "intervention" makes actual events appear more favorable to ourselves. We insist "the market is wrong" instead of admitting our predictions were. This dissonance allows us to avoid being scarred by mistakes and to move forward to the next trade. However, by reducing sensitivity to our mistakes we're encouraged to repeat them. The upside is that by deluding ourselves we preserve the ability to keep taking actions, some of which work out well; the downside is that we also preserve the ability to take poor actions by not learning from mistakes.

CHAPTER 6
Heuristics and Biases

The previous chapter discussed a general approach to decision-making and some high level reasons for decisions being difficult. This chapter discusses more specific reasons for lapses in trading decisions. Besides cognitive dissonance, many other features are preset in the bio-PC of the human brain. Heuristics and biases also are pre-programmed features that can explain other sources of decision-making irrationality.

Beginnings of Behavioral Finance

In the 1970s, Daniel Kahneman[36] and Amos Tversky systemized prior research and founded the new academic discipline of behavioral finance that focused on distortions in decision-making. They questioned whether our thinking process actually works in ways suggested by Rational Expectations Theory (and its derivative, Efficient Markets Theory). They posed this question after researchers transformed knowledge of heuristics and biases into Prospect Theory,[37] discussed in the next chapter.

Tversky and Kahneman identified three types of heuristics: *representativeness heuristics*, *availability heuristics*, and *anchoring heuristics* along with their corresponding biases. They defined heuristics as patterns of false learning that lead to judgmental errors, but in applying their observations to practice it's more useful to view them as learned patterns that cause identifiable errors in thinking called *biases*. Each heuristic has several corresponding biases. It's useful to recognize their relevance to your trading and to adjust for them when they appear.

Representativeness Heuristics

A good illustratation of the representativeness heuristic provided Voltaire in calling one of his protagonists, Master Pangloss, "the best philosopher of the whole province, and consequently of the whole world."[38] Tversky and Kahneman raised three points. First, people act on entrenched intuitions about the results of sampling (i.e., we generally consider familiar or likely outcomes as only ones possible). Second, this tendency affects the experienced and the lesser skilled equally. Third, following mistaken intuitions leads to poor conclusions.[9] The representativeness heuristic is evident in the saying "The cemetery is full of traders whose last words were, 'I've never seen that before.'" These lost souls over-relied on their experience, ignored relevant new information, or estimated probabilities incorrectly.

In statistics, the representativeness heuristic emerges when people base decisions on a sample that doesn't capture all characteristics of its population. People encounter this problem when they assess all possible outcomes based on a limited set of experiences. For instance, you estimate a 70% chance of an event occurring. After testing your estimate 10 times, the results are below 70%, and you discard your estimate. Unfortunately, you may still be correct. Had you conducted 1,000 tests and only 25 confirmed your estimate, then your rejection would be justified. In this case, 10 iterations was a random sample, not a representative sample of general tendencies across the population of outcomes.

Besides believing that random samples fully represent a population, people assume that samples from the same population balance each other (their means average out) in a process of self-correction. Perhaps that's true for large samples, but it isn't for smaller samples. A belief in the representativeness of small samples is called the Law of Small Numbers. For instance, after Apple shares undergo a short consolidation, options traders may sell strangles expecting range-bound markets, which often occur as prices consolidate during a trend. Instead of viewing prices over a long period (the entire population), they use the trend of the latest two weeks (the sample) as the basis for selecting their strategy.

Here are other instances of Tversky and Kahneman's representativeness heuristic.

Insensitivity to prior probability of outcome. Several investigations concluded that people disregard base rates when additional, unrelated information appears. Suppose it's known that more farmers than librarians live in a vicinity. Even so, a shy, well-dressed man in glasses is more likely to be taken for a librarian than a farmer. His appearance doesn't change the statistics, but people ignore them in favor of impressions. Many investors commit this mistake when they take a position in the direction of a trend ahead of a major support or resistance area, reasoning that directional momentum was strong. As is often the case, unfortunately, the technical level held. Stopped out on the rebound, they're angry at themselves for disregarding the technical signal.

Insensitivity to sample size. Is there a good or better chance that more than 60% of newborns will be males if they're delivered in a large rather than a small hospital? Most respondents wrongly answered "Yes." Remember, the larger the sample, the more it represents the population, and the closer is its result to the mean for the population—here, a 50:50 male-female ratio for newborns. At a smaller hospital the sample size is smaller, and it's deceptively easy to surmise something other than a 50:50 ratio for newborns. Similarly, traders often judge the talents of others based upon too few observations and are surprised when those talents are later unconfirmed.

Misconceptions of chance. If you flip a coin five times and get tails five times, you may expect the next flip will be heads even though the probability of another tails is equal. But having flipped a sequence of tails, you begin to believe heads are due to come up. Investors who lived through several days of markets that open "limit up" (or "limit down") expect a retracement, if even briefly.

Insensitivity to predictability. Analysts and investors often forget Niels Bohr's remark, "Prediction is very difficult, especially if it's about the future." They take companies' PR statements as guidance about future valuations without critical thinking. This bias especially the latter as an antidote: don't fall into wishful thinking, don't think of yourself as an oracle, and don't uncritically approach any forecasting exercise. For instance, investors make long-term predictions by interpolating current conditions, or analysts mistakenly think any short-term movement may inaugurate a new trend. This is an issue for options traders who take low-delta positions expecting to profit from promising technical patterns which aren't complete. Later we show that low-delta options are wisely used only when a confirmed trend is underway.

The illusion of validity, or confidence based on disputable reasons. People make decisions based on information consistent with their beliefs even though it may be uncorrelated or redundant. For instance, the explanation of a bullish move "There are more buyers than sellers" is a valid reflection when there's no clear explanation for a move. But often people come up with explanations that don't make sense but are nonetheless repeated. For example, a statement that appreciation of the dollar or higher interest rates pressures stock prices sounds logical. However, in most cases the correlation isn't direct.

Misconception of regression. The adage "Trees don't grow to the sky" warns about this misconception. For example, instructor pilots were baffled when cadets' performance deteriorated after being praised for a successful flight. According to Tversky and Kahneman, the instructors hadn't considered *regression to the mean*—i.e., mediocre performance often follows excellent performance. In other words, the cadets' failure to respond to motivation wasn't the issue. Traders experience this situation when they bet on technical momentum.

The representativeness heuristic refers to regarding expected outcomes as the only ones possible, but Nassim Taleb[39] devoted a book to unlikely events happening more frequently than statistical models suggest. In particular, Taleb mentions the philosophical equivalent of the representativeness heuristic—the method of induction used to draw universal conclusions. David Hume and Karl Popper (mentor of George Soros) dismissed induction as an acceptable scientific method. Popper famously commented, "No number of sightings of white swans can prove the theory that all swans are white. The sighting of just one black one may disprove it." In short, a statistically atypical event isn't impossible.[40] "Sure trades" can go wrong.

Unexpected events can change the established market dynamic, and that happens often in emerging economies. During the 2008 crisis, stock indexes collapsed daily. Frequency of high magnitude moves statistically "should" occur once every 10,000 years. Options trading is an activity in which unexpected events happen most often due to options' inherent leverage. Investors, especially in unhedged directional positions, experience profit and loss fluctuations far exceeding those in unleveraged underlying positions of equal size.

Availability Heuristic

Representativeness heuristics overemphasize likely scenarios, but availability heuristics are more extreme, focusing attention on single possibilities. This heuristic captures your inclination to estimate the possibility of an event on the basis of striking or recent information. For instance, if a friend had a heart attack, you'll think you're having a heart attack every time you feel chest pain. Your subjective estimate of the risk of having a heart attack rises.

This skew in evaluating outcomes is relevant to trader burnout. Traders who lost money through unexpected events fear their recurrence. As the number of such situations increases with experience, traders' become more prone to fear catastrophic scenarios, and those psychological cockroaches keep them from making decisions in critical situations. Like generals, traders fight past wars.

Availability heuristics may stimulate options traders to buy "wings"—OTM options, for instance. Having witnessed calamities during the Lebanese Civil War, Taleb advocates OTMs because his life experience proved that unexpected events happen often. In contrast, traders who have experienced reasonably low-volatility environments tend to be governed by representativeness heuristics and probably prefer selling low-delta options.

DeBondt and Thaler[41] hypothesized that sharp market reversals result from both failure to consider regression to the mean and from emotions fostered by new recent information.

Several predictable biases result from the availability heuristic.

Bias due to the retrievability of instances. A recently viewed TV commercial could stimulate an unwarranted trade. Unpleasant experiences with previous investment strategies may scare you away from them when they're warranted. However, as with all heuristics, unpleasant experiences also can provoke inclinations for greater risk. For example, a study determined that a CBOT Treasury bond trader who suffered losses in the morning was 16% more likely to take excessive risks in the afternoon than a trader in the same pit who made money that morning.

Bias due to the effectiveness of a search set. People tend to form opinions based upon information that's easily obtained. "Don't tell me about the market; tell me whether I should buy or sell" is an example of investors who give up trying to understand the entire situation and demand easy-to-understand guidance for decisions.

Imagineability Bias. When evaluating whether any undertaking will fail, people often detail every possible risk without considering the probability they will occur, thereby overestimating or underestimating the peril of the outcome. For instance, lawyers often identify every conceivable risk without estimating its probability of occurring, making a particularly good idea seem too risky. Risk managers can manipulate senior management by regaling them with potential problems without assessing the realistic probabilities they‘ll occur. Long-only investors pay high prices for low-delta puts to protect against losses with low probabilities of occurring. This is especially true for inexperienced options investors, who buy back short positions at a loss as soon as the market temporarily turns against them. They're swayed by the "unlimited risk" of a short position without quantifying the risk.

Illusory correlation is the tendency to see associations when none exists. A joke demonstrates the point. A man had a talkative parrot that began screeching while he was trying to watch football on TV. Unable to hear the game over the bird, the man grabbed it and stuck it in the refrigerator. When he opened the fridge after the game, the ice-encrusted bird nodded at a frozen chicken in the fridge's corner and asked, "What did this guy do wrong?"

Illusory correlation is dangerous because it motivates investors to take positions in one market based on their view of events in another market rather than taking a position in the latter market. For example, an investor opens a position in the currency market because of his views on US interest rates. By doing so he subjects himself to a risk that his view of one market will be correct, but the position in the other market will fail because it was unrelated to the original market. We discuss this issue in Chapter 17.

Anchoring Heuristics

All heuristics overlap. We can try to split their obvious spheres of influence in the following way. The representative heuristic warns us about our inability to evaluate probability and predict. The availability heuristic cautions about our reactions to immediate but somewhat related events (like in Strotz's discount function). The anchoring heuristic points to the inability to separate unrelated events.

Anchoring heuristics prompt us to evaluate situations based upon misleading or incomplete influences from prior situations. Salespeople set initial bargaining prices high, hoping to mislead customers by establishing a higher price as an initial reference. Wine stores display expensive wines in the window to adjust shoppers' expectations in favor of more expensive wines. In both cases, an introduction of tangential "information" skews judgment.

This heuristic underlies Abraham Maslow's (author of Maslow's pyramid) "syndrome of a man with a hammer": a man with a new hammer walks around looking for something to nail.[42] To take an investment example, traders employ favored, familiar strategies in multiple situations, some of which are unwarranted.

Economist Robert Shiller invoked the anchoring heuristic to explain why US analysts recommended Japanese stocks in the mid-1990s. Having traded at outrageously high P / E ratios throughout the 1980s, Japanese equities collapsed in the 1990s. Analysts began recommending Japanese stocks based upon their then-lower P / Es. Anchored in previous higher P / E ratios, their analysis was unrelated to the market's revised fundamentals.

Anchoring heuristics is very pronounced in options. Even small option positions may influence your thinking about the market overall. Suppose you're long a stock and sell calls on those shares to boost yield (a covered call strategy). Then the market turns. If you didn't own the short position, you might sell the shares. Instead you start second-guessing yourself and ask "What if the market recovers and I start losing money on the call because it's not hedged?" Buying the option back means admitting you were wrong, and that's somehow more difficult when trading options rather than stocks.

Tversky and Kahneman pointed out numerous biases in judgments that originate in the anchoring heuristic and survive despite being contradicted by facts. For example, proxy investing is a manifestation of an anchoring heuristic. Proxy investing is the selection of an investment based on behavior of unrelated assets. In 2009–2011 equity traders tracked Norway's kroner and Australia's dollar as indicators for equity trading. They reasoned that Norway produces oil and Australia raw materials, therefore demand for their currencies indicated industrial demand for raw materials, which implied overall prospects of growth for the global economy. In this example there is no contradiction, except that currencies can move on issues unrelated to global economics. Since equity investors don't really understand them, they get anchored to an unstable basis.

The anchoring heuristic manifests itself in several biases.

Insufficient adjustment of judgment occurs in the presence of irrelevant associations.

In an experiment, Tversky and Kahneman set up a wheel of fortune with numbers from 1 to 100. Participants were split into groups and asked to name the percentage of African countries that belonged to the United Nations). When the wheel stopped around 10, participants generally estimated the percentage of nations at about 10. The same result appeared when the wheel stopped around 25. The median estimate was 45 when the wheel stopped around 65. The irrelevant number on the wheel influenced perceptions of a completely unrelated subject. This bias is among the most damaging to traders. Traders hear opinions on TV, from analysts, and from each other. Most may think those opinions don't influence them, but this bias points out that isn't so: the least relevant ideas may skew our decisions.

Biases in evaluating conjunctive and disjunctive events. If several events are essential for a desired outcome, statistics refers to that situation as "conjunctive probabilities." If events producing the outcome are unrelated to each other, statistics refers to them as "disjunctive probabilities."

People generally overestimate the likelihood of events involving conjunctive probabilities and underestimate those involving disjunctive probabilities. For instance, traders of exotic options must correctly estimate not only timing and direction, but also the prevalence of a trend and its extreme point. Even if the independent probability of each of these four factors is high, their joint probability of occurring simultaneously is far lower. Investors who diversify into low-correlated assets may underestimate the occurrence of independent events (disjunctive probabilities), as we saw during 2007–2009, when nearly all markets reported bad news at the same time. Disjunctive events are often what we mean by good luck and bad luck. When several unexpected events line up in your favor, you make money and call it luck.

Anchoring in the assessment of subjective probability distributions. Questions about the future value probability distribution of the Dow Jones Industrial Index can be evaluated two ways: as the probability of two different outcomes or the probability that the result exceeds an expected limit. For instance, you can believe that the Dow is about to move sharply up, but if offered to sell a put you may say that you consider the risk of collapse as significant. Here you mix the potential with risk and come up with an incompatible trading view. One question has greatly differing valid answers because they have different internal anchors.

Here's a demonstration of this heuristic. Before the 2012 Russian elections, a financial commentator displayed Figures 6.1 through 6.4.

Figure 6.1
1996 Elections (Market declined 36% within one month)

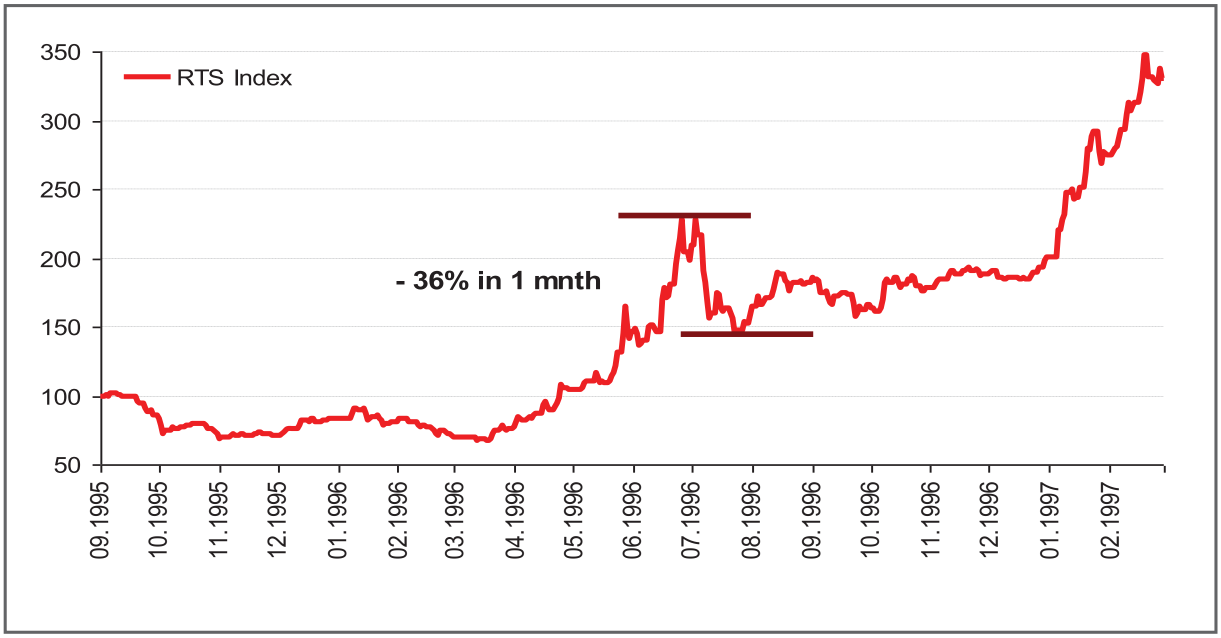


Figure 6.2
2000 Elections (Market declined 33% within three months)

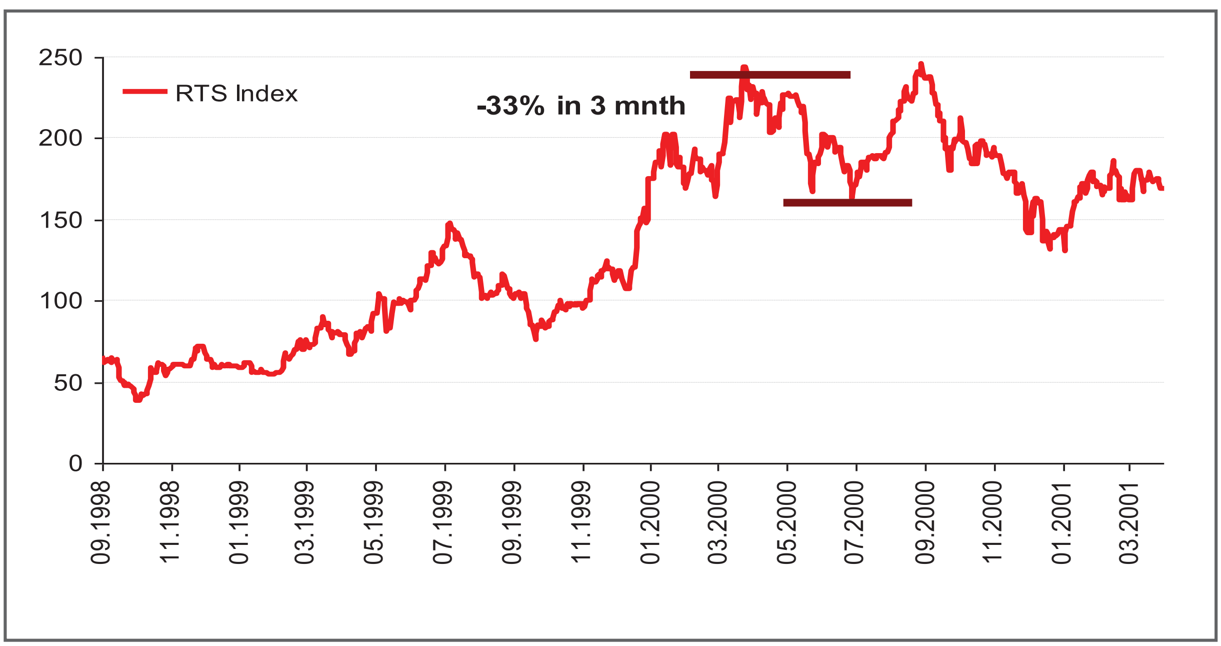


Figure 6.3
2004 Elections (Market declined 23% within four months)

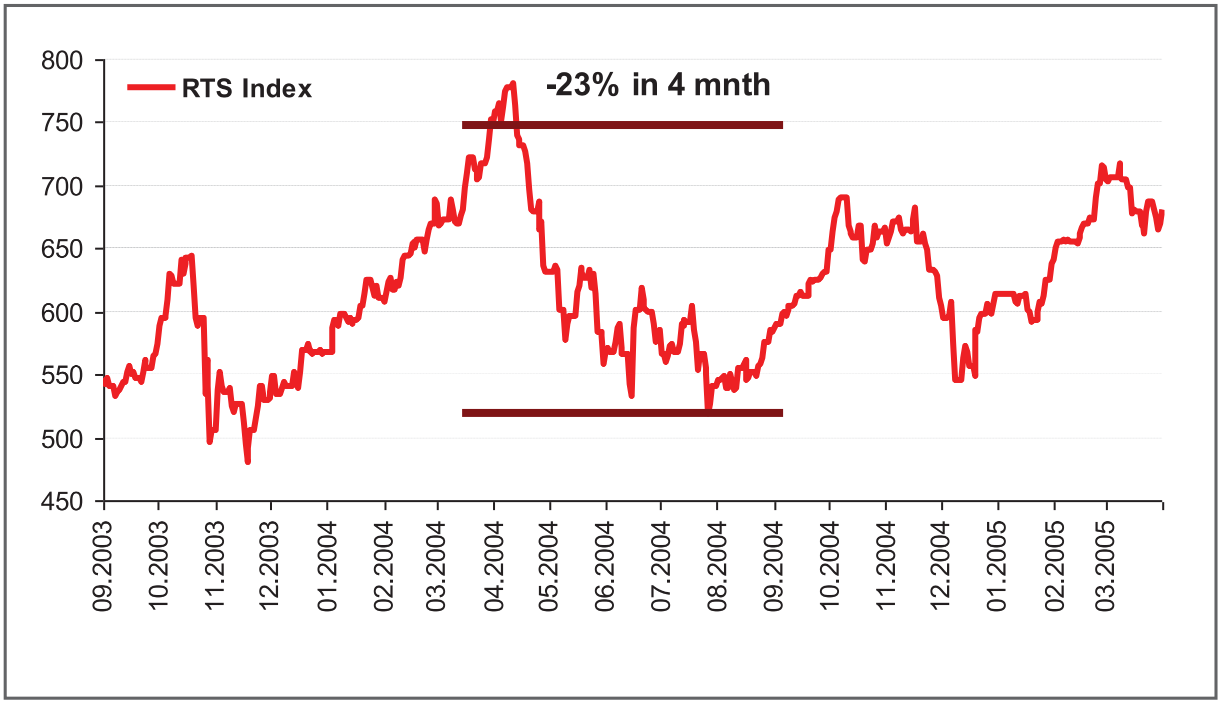
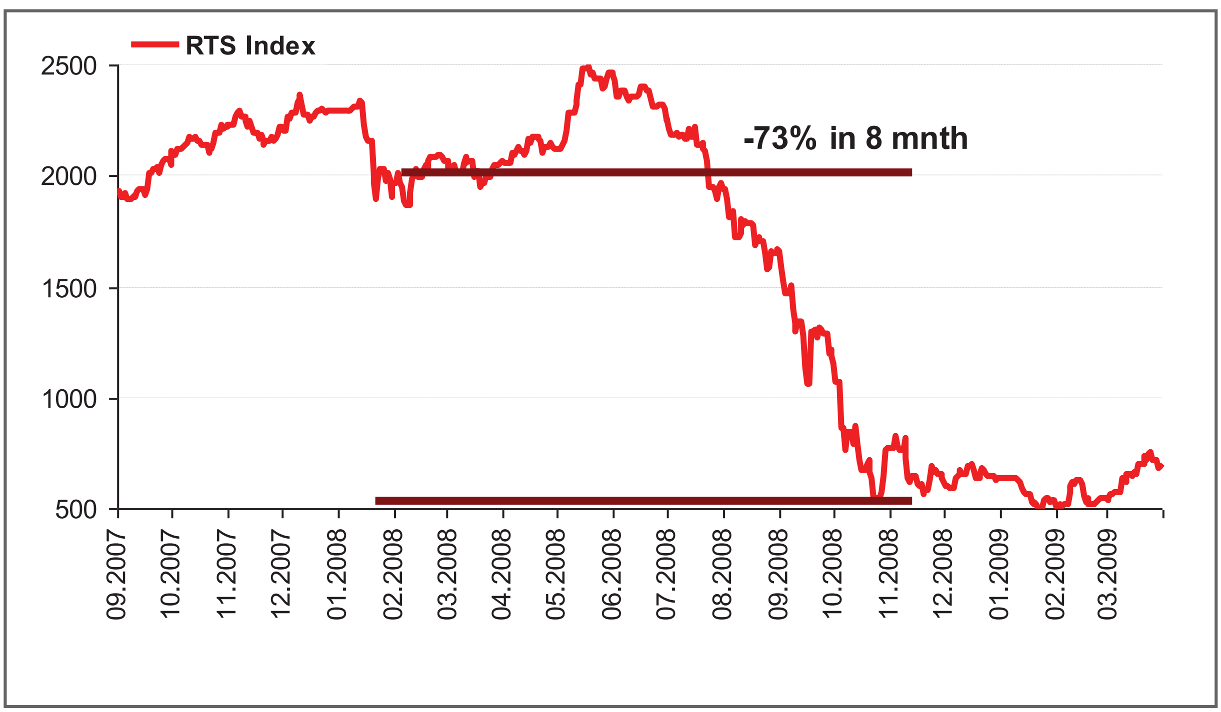


Figure 6.4
2008 Elections (Market declined 73% within eight months)



The commentator concluded that investors should sell after elections. Would you say this conclusion is counterintuitive? Normally, markets sell off *before* elections because of anxiety or uncertainty about winning candidate's new economic strategy. That was particularly so after the 1996 election, when the Communist Party candidate, who vowed to reestablish the Soviet Union if elected, lost. Why would the market go down after the menace passed?

The winner of the other elections was expected long before the elections, so there was no reason to sell the market once he was confirmed. However, the real reason behind the selloffs likely had little to do with elections. Namely, the commentator influenced by the anchoring heuristic that tied market behavior to elections. Russian markets generally sell off every May, as do almost all world markets—a weird pattern that first appeared in 17th century England! Russian elections coincidentally occur in early spring. Shortly thereafter, the market sells off in a recurring intra-year pattern unrelated to election years and not specific to Russia.

Here's an entertaining example of the anchoring heuristic. In the early 1990s, Citibank's advertising slogan was "Citibank helps you not only to survive, but to succeed!" At that time, a friend of mine headed Citibank's corresponding banking relationships in the Mideast. In 1991 during the first Gulf War, Iraq threatened Israel with Scud missiles carrying chemical warheads, and Israelis were buying gas masks to protect themselves. My friend recommended to senior management that Citibank court Israeli bankers by sending them gas masks with the message "Citibank helps you not only to succeed, but to survive!"

Poor decisions rarely result from the influence of a single heuristic or bias. For example, perhaps someone can't see the forest for the trees because he lacks ability to see the big picture. If you regard "the trees" as the sample and "the forest" as the population, the proverb illustrates the representativeness heuristic: all trees in the forest will be like these trees. But if "the trees" distracted him with their beauty and prompted him to disregard the forest, the situation illustrates an availability heuristic (the main meaning of the saying). If the decision-maker goes into the forest and compares every tree there to the one he saw initially, the anchor heuristic is dominant.

Overconfidence and Related Biases

Overconfidence is one of the more interesting biases. People afflicted with it underestimate risks and overestimate chances of success. For instance, most drivers believe they're above-average drivers. Investors must make decisions with confidence, and it's difficult to define when confidence becomes excessive. Overconfidence in interpreting markets may cause problems defining investment strategies.[43] That creates a related phenomenon: people estimate probabilities of positive and negative outcomes not by using a normal distribution with symmetric probabilities of failure and success, but a lognormal one where the probability of failure is lower than a probability of success. Imagine how much this trait hurts investors!

Over-confidence occurs within representativeness heuristics as well as the other heuristics and biases. Excessive optimism, wishful thinking, illusions of control, hindsight bias, belief in expert judgment, and irrelevance of history—all are ways in which overconfidence manifests itself.

Optimism bias refers to a systematic planning fallacy. For example, people routinely underestimate the time needed to complete tasks. Even if people estimate probabilities correctly, they believe themselves exempt from them. For instance, they know that half of marriages end in divorce but assess the probability of their marriage dissolving as unrealistically low. Traders joke about the misfortunes of others, demonstrating implied optimism that they'll avoid similar fates. The best advice for this malaise is the biblical injunction "Thou shalt not judge."

The illusion of control appears when people believe in their ability to control random events or that their actions can influence outcomes. For example, many gamblers believe in the power of lucky charms or that the harder they through the dice the higher will be the score. Langer[44] demonstrated this bias with an experiment in which two groups chose a card from a deck, the winner being the person holding the highest card. Before choosing, they bid on the value of their expected card. One group included a person who looked like a schnook and the other had a person who looked like a dapper. You'd expect the group's composition wouldn't influence the bids, but the average bid of Group 1was considerably higher than Group 2. In other words, the sense of competing with a skillful person reduced bid sizes in the second group.[45] The illusion of control is a consequence of people's tendency to find regularities where none exists. For instance, technical analysis is a realm in which investors draw conclusions from doubtful technical patterns in the belief they represent reliable signals.

Hindsight bias leads us to believe our previous forecasts were more successful than they really were. Financial analysts afflicted with this bias often confidently, but inaccurately, claim their prior forecasts were correct. In one experiment, a researcher asked business students to forecast the market while it was falling. Later, after the market had reversed, he asked them to recall their previous forecasts. Initially, the students were bearish, but then the market reversed. At the semester's end, most students claimed their initial forecasts were bullish.[46]

Hindsight bias and cognitive dissonance demonstrate how memory betrays us. The first "remakes" past events, whereas the second, "corrects" previous forecasts of future events. If a trader claims he bought something at the right price but actually didn't buy it at all, he was a victim of cognitive dissonance. If he claimed to have predicted the market would rise but in fact was bearish, hindsight bias is the likely explanation.

Overconfidence also causes unwarranted beliefs in the expertness of our own judgment. Having been in a business a long time, people consider themselves experts and overestimate their ability to predict events. The longer between a prediction and its verification, the greater the bias effect, since differences between short-term forecasts and actual results are easily confirmed.

The irrelevance of history, mentioned when discussing the representativeness heuristic, also causes overconfidence. Often we hear of "visionaries" who discover a new paradigm for making money. But after talking with them you realize they don't know if their strategy had been tested and proven for a specific market condition. For example, selling put options against the trend is sound as long as it's done near the beginning of a long-term trend or consolidation. However, many traders believe the famous strategy "premium is equal profit" is a ticket for printing money and sell put options in every situation.

Other Frequently Experienced Biases

During the past 30 years the number of documented examples of bias has increased. Understanding them will help identify your psychological makeup and refine your trading style. Heuristics and biases aren't harmful in themselves, but failing to recognize them can be.

Belief preservation bias expresses itself as the tendency to ignore facts that contradict our viewpoint. Economist J.K. Galbraith offered its best description: "Faced with the choice between changing one's mind and proving that there is no need to do so, almost everyone gets busy on the proof." In the final analysis, factors that confirm our views receive more attention.

Fear of regret (*Regret theory)* partly explains belief perseveration bias. People avoid recognizing mistakes and diminishing their pride. As a result, they delay exiting unprofitable trades. Related to cognitive dissonance, fear of regret may explain research that shows people invest in successful mutual funds at faster rate than they withdraw from unsuccessful ones. It can also explain why investors don't size properly positions: they take larger positions than money management warrants because they're afraid to regret not seizing a once-in-a- lifetime opportunity if the market moves in the expected direction.

Disposition bias[47] causes investors to fall in love with their investments and to ignore bad news about their companies. Thus, investors are ready to close losing positions in a company in case of unexpected negative general economic news, but they won't if the negative information is related specifically to their company. As regards general economic news, they don't think the loss is their fault, but in the case of company-specific negative news pride prohibits them from admitting their mistake.

Disposition bias suggests why investors avoid closing losing positions and close profitable ones earlier than necessary. When a position goes their way, people tend toward fear of regret bias if they don't seize the gain. When positions go bad, they lack decisiveness because of disposition bias. It's difficult to survive in the market without a strategy for controlling this psychological trait.

Since options are term products, their advantages serve longer-term strategies. Investors often fall in love with their decisions, and ridding ourselves of this affinity is a problem well described by disposition bias. In other words, investors have difficulty accepting that their idea may have been incorrect. It's even worse for a longer-term idea, as we have an excuse not to react to new developments since we justify our inaction by saying we've adopted "a long-term view."

Another form of disposition bias is the *sunk cost effect*. To avoid showing a loss on a previous purchase of equipment, firms avoid substituting cheaper and more efficient equipment. Those who participated in initial decision are more vulnerable to the sunk cost effect than those not involved. Heads of trading departments sometimes circumvent this problem by assigning a losing position to a trader who's not emotionally involved with it.

Endowment bias relates to a tendency to set a higher price on things you possess than on things you don't. In options you'll often compare performance of your underlying asset to its peers (for instance, other metals) and think that options on your underlying should trade higher (or lower) because it's more liquid or because of higher historical volatility. Unfortunately, they don't trade higher, and you consistently lose money on spread trades against options on other underlyings.

House money bias is the tendency expressed by the saying "easy come, easy go." Gamblers take greater risks when betting money they previously won ("house money"). Investors do the same, risking more when reinvesting profits.

Also noteworthy is *herding bias*, in which people tend to follow the actions of others. The bias predisposes investors to (a) base their actions on badly studied conclusions, (b) change opinions based upon ill-considered facts, and (c) postpone obvious decisions and then execute suddenly without clear reasons. Few investors avoid herding bias. In fact, a huge part of the investment universe consists of momentum traders, who train themselves to profit from the herding instinct. However, excessive trend-following becomes dangerous for options traders who lengthen expiration dates beyond the horizon of the perceived trend.

CHAPTER 7
PROSPECT THEORY

The Framing Effect

Kahneman and Tversky described several other perceptions that thwart our faculty for "rational decisions." One is the *framing effect*. That is, people generally don't assess an outcome as positive or negative in itself; rather, we assess it within a frame of reference that accentuates the affirmative or negative. If we change our frame of reference, we may change our opinion of the proposition. For instance, novice investors often won't buy a low-delta option because it's unlikely to enter the money. However, asked if they'd sell that same option at a low price, they'd rather hold and hope it goes in-the- money eventually. The same investment may have equally low likelihood of gain, but in the first instance the investor won't *enter* the trade because his frame of reference accentuates its low likelihood of gain, and in the second instance he won't *exit* a trade because his frame of reference excludes the low likelihood of gain. He takes different actions after analyzing the same option within different perceptual frames.

The following joke demonstrates the framing effect. A parishioner asked his priest if he could smoke during the prayer, and the priest answered "No." A fellow parishioner took a different approach. He asked the priest, "Father, may I pray while smoking?" The priest, of course, said, "Yes."

Another example. A gambler lost $140 betting on the horses, so in the final race he bet $10 on a horse with 15:1 odds. There are two ways to frame his bet. If your reference point is today's losses, the dilemma is framed as "Recoup all your losses or increase them significantly."[48] If your reference point is the present wager, not earlier losses, the framing effect presents the alternatives as an unlikely gain of $140 or a likely loss of $10.

In sum, how we frame an issue shapes our decisions. For instance, an investor might never consider buying an expensive option as a directional investment, but he'll consider buying it as a hedge. Framing effect is one of the main foundations of technical analysis: technical patterns we choose, are the frames around which we build our strategies.

The *mental accounting effect* offers another insight into decision-making. Suppose you've decided to see a movie, and the ticket costs $10. While walking to the cinema you lost the $10 bill you planned to spend on the ticket. You have additional money and could buy another ticket. Will you? When asked, 88% of respondents in an experiment said "Yes." Now let's change the conditions. Suppose you'd bought the ticket and lost it instead of the $10 bill. Will you buy a new ticket? Only 46% said "Yes."

In both situations, the loss is identical ($10 and seeing the movie), as is the cost of the follow-up investment (spend another $10) and its gain (seeing the movie). In the first situation, people hadn't bought the ticket, and they perceived they'd lost $10, not the chance to see the movie. In the second, they perceived they'd lost the chance to see the movie (i.e., the ticket), not their money. Buying a second ticket essentially meant paying $20 to see the movie, which was more than they cared to pay.

The mental accounting effect also helps to explain investors' loyalty to high-dividend stocks. They regard capital gains and losses as different from dividends, so they enter the respective stocks in different mental "ledgers."

Prospect Theory

These and other behaviors comprise Kahneman and Tversky's formulation of Prospect Theory,[49] which is the basis of behavioral finance. Prospect Theory claims that when *choosing between positive outcomes (such as profits), people prefer certainty and tend to minimize risk—i.e., choose less risky outcomes with greater chances of success. In situations associated with negative outcomes (such as losses), people choose riskier outcomes that portend maximum quantitative results*. For instance, if you lost money on a trade, you're likely to double down. If you're making money and have the chance to double up at the risk of losing all your gains in a retracement, you're unlikely to do so because you naturally prefer to avoid risking your profits.

Their important conclusion is that people's primary motivation is loss aversion. We'd rather receive $100 than take a 50 / 50 chance of winning $200 or losing everything. But we'll bet $100, if our choice is to lose $100 or break even.

Overall this idea seems proven, but it presents real or apparent conflicts with other ideas. For instance, note how this observation conflicts with the house money bias that says that people take greater risks when investing trading profits.

The next situation only seems like a conflict, but you must understand the theory to see why. Research into patterns of 30 stocks quoted on the NYSE and AMEX in 1981–1985 confirmed that trading volume was above normal when prices were rising and below normal when prices declined. This shows that investors don't double down on the way down. However, the phenomenon also shows that investors generally reduce positions when they're make money but hold them when they're losing money. This explanation fits Prospect Theory while on the surface contradicting it.

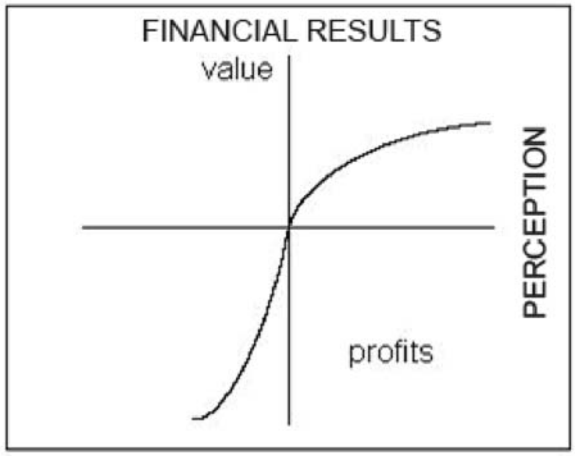
To continue, consider the accepted observation that new traders burn out because they don't cut their losses, whereas experienced traders burn out because they take profits too early. Prospect theory explains both situations. Inexperienced traders take excessive risks in cases connected with negative outcomes, whereas their more experienced colleagues prefer definiteness in cases connected with a positive outcome.

To review the concept let's reflect back on the framing effect. When framing situations in the perspective of profit (i.e., when the objective is to enhance profit), people avoid unlikely (low-delta) options to make more money. For instance, they avoid unlikely bets at the race track. When framing situations as a matter of minimizing or recouping losses, people choose the alternative with the highest potential payoff despite its low probability and likely additional losses. In other words, *after winning, aversion to risk prevails; after losing, we look upon risk more affirmatively*. The same is true when choosing between high-probability / low-return and low-probability / high-return outcomes: if you start from a position of neutrality (facing a new dilemma) you choose the certain outcome. If you start from the position in the red, you'll choose the less certain outcome.

In other words, people *prefer certainty when choosing positive outcomes, even if greater certainty entails smaller payoffs*. Conversely, *to avoid losses* they'll adopt strategies with low probabilities of gain, even if it means risking additional capital. This understanding is central to Prospect Theory, and it explains among other things why novice investors have difficulty taking losses.

When we try to depict Kahneman and Tversky's conclusion graphically, we must consider several other observations. Researchers confirmed the views of Bernoulli[50] and Markowitz that people don't seek merely to increase wealth (as utility theory claims). Rather, they consider relative rewards. A student may spend days shopping to save $5 buying a $15 calculator, but he won't spend days searching for a $125 jacket priced at $120, for that $5 has less relative value. In other words, when it comes to profits, our perception of value levels out as they increase. When it comes to losses, the perceived negative effect is greater than our perception of equivalent gains. Figure 7.1 illustrates Kahneman and Tversky's conclusions.

Figure 7.1
Value Function



The value function curve in Figure 7.1 depicts the issues discussed earlier. On the horizontal line we have financial results; on the vertical line, their subjective perception. The figure demonstrates:

- Pleasure from earning gains is less than the pain of losing a similar amount, a phenomenon called *loss aversion*. Therefore, the segment of the curve representing profit is steeper than the loss function on the graph.

- When previous gains are great, further incremental gains are less satisfying. But after suffering losses, continuing losses aren't proportionally as painful. That's why investors often cancel stop-loss orders shortly before prices hit the execution price. Even though investors know they could lose more money, the subsequent loss doesn't hurt as much as the previous loss.

- The reference point discussed in connection with framing considerably influences investors' analysis of an outcome.

This glance at behavioral finance demonstrates that investors increase their chance of success through strategies that minimize the counterproductive influence of biases. Throughout the book, we'll point out situations where these and other biases and heuristics are recognizable.

PART 3

FUNDAMENTALS OF DIRECTIONAL OPTIONS TRADING

CHAPTER 8

VERTICAL AND RATIO SPREADS

Since 2007–2009, capital available for speculative transactions has been scarce. Investors are learning techniques to preserve capital and are looking for ways to maximize leverage. This section offers principles for creating trading strategies different from those used by market-makers. Options spreads are an underappreciated topic and, because of their potential, one of this book's most important subjects. Spreads are created by using various combinations of options. Most fall into three categories: vertical spreads, horizontal spreads and ratio spreads.

Spreads: Inherent in Investing

The concept of a spread is intuitive. We instinctively calculate a "mental spread" when we figure, "For $X, I could buy 10 of this or 15 of that." Nonetheless, merely comparing alternative purchases is a naïve calculation and mental exercise compared to options spreading. The primary distinctions are, first, in understanding how an investment strategy serves your objectives and, second, in knowing how to optimize capital by assessing the specific benefit of a specific opportunity—for instance, participating in a price range within the market's general direction. The principles and process of options spreading force you to formalize your thinking, to select only choices suitable for your market view, and to upgrade your decision-making, albeit in ways relevant to investing generally.

Impact of Volatility Increases on Changes in Strikes of OTM options

Let's review the effect of rising volatilities on OTM options. Table 8.1 compares increases in volatilities, differing strikes, and prices of one-month 20-delta and 30-delta OTM calls. At higher volatilities, the distance between strikes of OTM options increases. Priced at 20% volatility, it's $11 ($620 − $609). At 30% volatility, the distance between the strikes of a 20-delta and 30 delta options rises to $17 (636.5 − 619.5). Also, the further an option strike is from ATM, the more its strike drifts as implied volatility rises (636.5 − 619.5). *That observation is exceptionally important for spreads*, especially for longer-dated ones. As volatility and time to expiration increases their price becomes a smaller portion of the maximum income potential of a spread. We will come back to this point again.

Table 8.1
Relations between Strikes and Prices of
One-Month Calls at Different Deltas and Implied Volatilities

Implied Volatility	20%		30%	
Delta	Strike	Price	Strike	Price
20	620	0.59%	609	1.03%
30	636.5	0.85%	619.5	1.49%

Vertical Spreads

A vertical spread consists of buying a call (or put) at one strike price and selling a call (or put) at another strike and the same maturity. We'll use the example of buying a 32 call and selling a 34 call (*a 32 / 34 call-spread*).

Advantages of Vertical Spreads

Because they're relatively inexpensive, vertical spreads add potential leverage while defining and limiting risk[1], the potential to earn more on your investment. We'll use the term "leverage" to indicate any enhanced opportunity to profit from constructing a spread, although some prefer a strictly technical definition.

Leverage is the presiding concept in spread trading: you must always assess the specific leverage you gain (if you buy) or relinquish (if you sell). For example, assume a stock is $32 per share and you have $1 million. For this amount of money you could buy a 32 call or a 32 / 34 call-spread, leaving you long the 32 call and short the 34 call.[51] The $34 is a price beyond which there are no further gains from the spread.

Since you forsake the unlimited gain above $34, the spread is less expensive than buying a $32 call. Hence it costs less to participate in your projected range of market movement ($32–34). Therefore, for the same investment a call spread lets you acquire contracts with a larger notional value—i.e. more contracts. For instance, you might buy 20 call spreads 32 / 34 call spreads instead of 10 $32 call options. This increases the position leverage within the 32–34 range (i.e., greater opportunity to make money). If you decide not to increase the notional size of the contract, you still end up in a relatively better position to make money because the spread will have a lower breakeven point than a single call option.

Perhaps your choice is between buying a $34 call or an equal notional amount of the $32–34 call spread. In this case, the vertical spread offers a higher probability of exercising the long call.

The forgoing discussion applies primarily to holding option positions to expiration, but spreads also enhance intermediate-term capital preservation. Having studied options Greeks in Part I, you see why. Until expiration, a position consisting of a 34 call is vulnerable to directional changes in price of the underlying and to price erosion from a decline in implied volatility and time decay. However, since the spread contains a long and a short position with identical expirations, the implied volatility and time decay affect prices of both almost equally. As a two-option position, the spread suffers smaller intermediate swings, and the strategy's main risk is just directionality. Note, buyers and sellers of uncovered calls are totally exposed to directional risk, volatility, and time decay.

Third, the risk-reward ratio for vertical spreads rises as volatility increases. Table 8.2 demonstrates the advantage of a 30 / 50-delta spread. The results follow conclusions derived from Table 8.1. Although the absolute premium increases as volatility increases (Table 8.2), the prospect of gain increases faster. Thus, at an implied volatility of 10%, the one-year spread premium is 36% of the difference between options strikes. With 50% implied volatility, the premium declines to 22% of the distance between to strike prices.

Table 8.2
Comparing Risk-Reward of 30:50 Delta Call Spreads
at Different Implied Volatilities

	Net Premium Paid for 30:50 Delta Spread		Premium as % of difference between spreads' strikes	
Days to Expiration	30	365	30	365
Volatility				
10	0.59%	2.03%	38%	36%
20	1.18%	3.90%	38%	32%
30	1.75%	5.58%	36%	29%
40	2.31%	7.00%	35%	25%
50	2.86%	8.17%	34%	22%

The fourth advantage for vertical spreads is the opportunity to benefit from skew, as we recall from our earlier review where we noted the implied volatility of OTM lower-delta puts frequently have higher implied volatility than ATM puts. This allows more efficient use of capital. When reviewing skew earlier, we noted that the implied volatility of lower-delta OTM puts frequently is greater than the implied volatility of ATM puts. For instance, the implied volatility of a 50-delta put is lower that of a 20-delta put. This increment in implied volatility translates into monetary terms—i.e., you pay or receive a bit more money with an option priced in higher implied volatility than with one ATM. In this case, the buyer of an ATM put gains a price advantage, for he buys a put with lower implied volatility and sells a put at a higher implied volatility.

Although this extra premium can be insignificant in absolute terms, the effect on capital utilization can be significant. To control skew, think of the relative effects on return rather than in monetary terms. For example, think of skew as letting you save 15% of your capital rather than, say, $100, for saving 15% of an investment is an attractive prospect. Investors forget this rule. They evaluate returns on the underlying security in relative terms and returns on options in absolute terms.

Disadvantages of Vertical Spreads

Psychological impediments preclude investors from taking advantage of this elegant strategy. Suppose you bought a 32 / 34 call spread and the price of the underlying stock reaches 34, the strike price of the option sold. Since you don't expect the market to rise beyond this level, you may decide to close the position (sell the spread back) and take your profits per contract. Unfortunately, you can get only \$1.50, an *un*impressive price, considering you probably paid around \$0.80. If expiration is distant, the time value of the 34 call remains high. The effect of the increased intrinsic value of the 32 call is reduced by the decrease in its time value and the increase in the time value of the 34 call. As a result, the spread fetches \$1.50, not \$2, per contract. This less-than-expected outcome disappoints investors who quantify profitability in absolute numbers and disregard rates of return. Greed impairs judgment when the market hits our targets, and we don't close the position at the expected maximum profit. Maybe that's why inexperienced or undisciplined investors complain that vertical spreads lack profitability.

In addition, some investors have difficulty properly analyzing risk-reward relationships. When buying an option with a strike near the current price of the underlying and selling a far OTM option, the price can be 35–50% of the spread's maximum potential benefit (the difference in strike prices). As a rule, a preferable combination is one in which the premium costs 30% or less of the difference in strike prices. Spreads based on the long 35-delta option usually have the best ratios. For instance, for a long-term 1.2500–1.3500 EUR / USD call spread when spot is 1.2500, we could expect the premium to be around 0.0400. Its breakeven will be around 1.2900, about midway between strikes. The potential in this trade may be uninspiring.

Oops! Think about what you just read!

If the spread offering a lower breakeven captures the likely upside, then the 1.2500 call lacks a compelling risk-reward altogether! That's how your thinking slips if you look at options strategies through a prism of spreads.

Tables 8.1 and 8.2 show that when implied volatility is higher, spreads can be bought with greater distance between strike prices for the same premium. Hence, greater volatility does enhance the risk-reward potential.

Exercise

Say you plan to invest $1,000. The price of a €1 million 1.2500 call is $2,000, whereas the €1 million 1.3000 call costs $1,000. The EUR 1.3500 call is $500 per €1 million of notional. There are three strategy choices:

- Buy a EUR 0.5 million 1.2500 call
- Buy a EUR 1 million 1.3000 call
- Buy a EUR 1 million 1.3000 call and sell a EUR 1.3500 call to create a long vertical spread.

Questions: If the current spot is 1.2500 ….
Which strategy provides maximum leverage within the current price range?
Which strategy provides maximum probability of gain?
Answer: In both cases, the vertical call spread is the right answer.

Ratio Spreads

Ratio spreads are key strategies for options investors and have greater potential than commonly thought. They force disciplined thinking about your market views and about payouts of different strategies for any investment situation. The logic underlying their use applies to investing in the underlying instrument as well as to options. Many issues in selecting strikes are unapparent, but ability to analyze ratio spreads is useful in other fields of trading.

Calculating Break-even of Ratio Spreads

Let's discuss the basics of ratio spreads. First, people tend to *buy* the strikes closer to the current price of the underlying and sell the strikes further out. The maximum gain of such ratio spreads occurs at the level of the short strike. That is, if you buy a call with a strike price of 100 and sell a call with a strike of 120, your gain is maximized if you exercise the 100 call when the underlying stock trades at 120 at expiration.

Second, if you buy an option with the notional equal to 1 and sell against it an option with a notional equal to 2, you're overall short an option with a notional of 1. If you buy an option with a notional equal to 1 and sell against it an option with notional equal to 3, you're overall short an option with the notional of 2.

Third, after calculating the notional of your net short position, you must calculate the breakeven of the entire spread. The "premium free" ratio spread at expiration starts losing money if the underlying surpasses the breakeven point. That's the point where the maximum gain on the long position is matched by the loss on the short position. There's a different way to calculate breakeven. For instance, if you have 10 of the 100 calls and 20 of the 120 calls, the difference between the short and long strikes is 10 units. The maximum gain on the entire position occurs at 120. That's where the 10 long units produce $200 of profit ((120 − 100) x 10).

After you divide this profit by the net short position of 10, you can find the point at which the net short position will lose as much as the maximum gain on the long position. This point is 120 + ($200 / 10). In other words, the breakeven of the premium free spread at expiration is 140.

If you did a "10 by 30, 100–120" call spread (bought 10 units of the 100 call and sold 30 units of the 120 call), the notional of your net short position (difference between the notionals on the short and long strikes) is 20 units. They will "destroy" the maximum profit of $200 when the price of the underlying asset exceeds 130 (120 + $200 / 20).

Comparing Features of Ratio Spreads with Different Notionals of Net Short Positions

To distinguish between strikes you bought and sold, discussions of ratio spreads use the terms *close strike, middle strike*, and *covering strike.* For instance, buying 10 of the 100 strike calls and selling 20 of the 120 strike in terms of risk is the equivalent of selling 10 of the 140 calls. That's a *synthetically* short position, because *at expiration* the ratio spread's result over 140 resembles the result of being short 10 of the 140 calls. In this combination, 100 is the close strike, 120 is the middle strike, and 140 is the covering strike.

In all our examples covering strikes are placed at the level of breakeven of the ratio spreads. This level will have a different calculation for spreads with initial investment or upfront collection of premium. Covering strikes can be placed at any price point, for instance at technical levels.

Table 8.3
Price Relationships of Three USD / RUB Ratio Spreads
(Spot 32.00, Implied Volatility 12)

Close strike (breakeven)	**33**	**33**	**33**
Notional ($ mln)	1	1	1
Middle strike	**34**	**34**	**34**
Notional ($ mln)	−4	−3	−2
Covering strike	**34.33**	**34.50**	**35.00**
Notional ($ mln)	−3	−2	−1
Credit / Debit (initial premium inflow / outflow)	−2,685	−921	−29
Maximum gain ($)	24,418	17,770	9,375

Table 8.3 shows three strategies. The long option notional values are marked "+"; the short option notional amounts are marked "–"; the 33 and 34 are the close and middle strikes for all three spreads. Breakeven levels (covering strike levels) differ for all three "synthetic" options. However, the notional values for "covering" options differ: $3 million for the first, $2 million and $1 million for the other two.

Table 8.3 itemizes *credit / debit* and *maximum gain*. Credit / debit is the total income / expense of the option position (bought and sold options). The distance between short (middle) and long (close) strikes multiplied by the notional of the "close" is the strategy's maximum gain. The size of the notional of the covering strike is the difference between the notionals of the middle and close strikes.

Table 8.3 is constructed so that all three strategies have the same notional value for the close strikes as well as the same strikes for middle options. Given the same notional of the close strike and the same investment, the greater the notional of the middle strike, the greater the spread's maximum profit potential.

The greater the difference between notionals of the middle and close strikes, the greater the size of the synthetic short covering strikes. For instance, as the 1:3 ratio position shows, the notional value of the covering strike equals 2, while for the 3:8 ratio position the notional value of the covering strike equals 5, and so on. A larger short position implies greater losses if the underlying surpasses the closing strike.

Build your own tables with different combinations of strikes for a given market scenario. One of the alternatives will naturally compare the impact of moving the middle strike further by increasing the amount. For instance, a zero premium 1:2:1 spread has less distance between the close and middle strike than 1:4:3. The further distant the close and middle strikes, the greater the maximum gain, given the same amount of the close strike notional and the same credit.

Moreover, the spreads will behave differently during their lives. Some expected issues appear in Table 8.4. If you use ratio spreads, you'll build such tables every time you act on your expectation that the market will trade within a range. Depending on the strength of your convictions, you'll execute more aggressive or less aggressive synthetic shorts. An important caveat of the strategy is to place the strike of synthetic shorts slightly beyond strong support and resistance areas.

Differential Time Decay – Behavior of Ratio Spreads before Expiration

The core issue in constructing defensive vertical rolls is how best to take advantage of differential time decay. We introduced this topic in Chapter 3 when discussing decay of options with different deltas. Table 8.4 demonstrates how the strategies work in time. This specific strategy gives you an initial credit equal 0. Yet due to faster time decay of the short options, for a while you can close it at an additional profit. This illustrates the defensive potential of ratio spreads.

Table 8.4
Profit / Loss Behavior of a Three-Month
1.3300 / 1.3600 1:2 Zero Cost Ratio Spread over Time

Spot	Days to Expiration	**7**	**14**	**30**	**60**	**75**	**89**
1.3000	Delta (%) Financial Result (EUR) Theta (EUR)	29 329 46	29 640 43	26 1253 32	19 1625 −20	11 957 −75	0 5 −5
1.3100	Delta Financial Result Theta	35 −104 60	34 311 58	33 1195 51	27 2210 2	20 1752 −81	2 69 −54
1.3200	Delta Financial Result Theta	41 −783 75	40 −260 75	39 921 72	35 2764 38	31 2848 −53	11 505 −275
1.3300	Delta Financial Result Theta	46 −1764 90	46 −1132 91	46 351 94	45 3144 85	44 4110 21	35 2157 −590
1.3400	Delta Financial Result Theta	52 −3095 103	52 −2364 106	53 −597 115	55 3167 137	57 5235 132	67 5779 −403
1.3500	Delta Financial Result Theta	58 −4821 114	58 −4005 119	60 −1993 134	64 2641 185	69 5805 251	89 10399 478
1.3600	Delta Financial Result Theta	63 −6974 123	64 −6094 129	66 −3898 148	72 1396 222	79 5392 342	96 13135 1253
1.3700	Delta Financial Result Theta	68 −9574 128	69 −8656 135	71 −6348 156	79 −685 241	86 3693 377	97 11731 1040
1.3800	Delta Financial Result Theta	72 −12630 130	73 −11699 137	76 −9360 158	84 −3651 240	91 612 352	97 6690 385
1.3900	Delta Financial Result Theta	76 −16134 128	77 −15217 135	80 −12925 154	88 −7475 222	93 −3729 285	96 −13 68
1.4000	Delta Financial Result Theta	79 −20066 123	81 −19187 129	83 −17013 145	90 −12064 190	94 −64 203	95 −7080 6

Initially the profit / loss of the spread resembles that of the synthetically short 1.3900 Call. If the spot price hovers near the covering strike as expiration approaches, the spread's profit / loss also will resemble that of the synthetically short 1.3900 call.

If the spot remains where it was when the trade was initiated, your initial result will be positive. It's not initially obvious in situations when you paid for the strategy—i.e., put it on at a debit—because with single options it's impossible to get positive time decay from the options you bought (except for exotic options that we'll ignore). To get a better feeling for the impact of time on the financial result, you should look diagonally and trace the breakeven of the position as the time goes by. It goes up and up. By the same token, see how theta and delta change. Therefore, understanding the intermediate dynamics of ratio spreads is crucial to adjusting your strategies as well as timing changes. Forecasting profit and loss changes before expiration forces you to choose the types of ratio spreads that suit your market view while placing the strikes around strong technical levels.

However, you should remember that in a way a ratio spread aspires to predict path-dependency. Not only do you choose the preferable market direction and likely timing of the move, you also choose a strategy that reflects your views about extremes of the ranges. In other words, you try to get on the path. Since these three factors are difficult to predict simultaneously with high degree of probability, in psychological terms, you can be more certain that you don't overestimate conjunctive probabilities as discussed in the section on behavior finance.

Here's a story to emphasize the importance differences in time decay.

Walking through a forest, two men encounter a grizzly bear. As they turned and ran, the bear followed. As the bear drew closer, one man stopped and pulled a pair of sneakers from his backpack and started putting them on. The second higher asked sarcastically if he really thought he could outrun the bear. "No," said the first, "but I can outrun you!" In this tale the pair of sneakers is analogous to differential time decay.

Butterfly Building for Market-Makers in Delta-neutral Positions

Market-makers maintain a book containing hundreds of open positions, and sometimes they can become becomes unmanageable. Instead of executing dozens of closing trades, they may choose to treat their positions as components of a butterfly. Calling for calculating the breakeven point for strikes above the current spot price (or curve, if you trade ATM options for which convention employs the ATM forward price rather than ATM spot / cash prices). Then they buy a single option that serves as a covering strike for the entire book. Alternatively, they break the trading book into time increments and use as many covering options as there are increments on each side of the current market.

Psychology of Working with Spreads

Here's a story about one of your author's colleagues that illustrates the importance of psychology when managing spreads. This colleague was a successful market-maker trading large delta-neutral or hedged option positions. He tried boosting his fortunes by taking unhedged positions that he learned from your author. At that time, the dollar / yen had been trading in a 102.00–105.00 trading range for three months. Many people assumed the Bank of Japan (BOJ) and the US Federal Reserve would support the dollar around 100.50–101.00. My colleague waited until the USD declined to 102.00 as volatility increased, and then initiated a USD put ratio spread, buying $10 million nominal value of puts at 102.50 and selling $20 million nominal value at 101.00. Considering the size of his book, he thought it was a modest position.

Since your author had been a market-maker, he knew the difficulty in switching from trading hedged positions to directional trading and tried to convince his friend to reduce his position size. He told him, first, that hedged and unhedged positions inspire significantly different intensities of fear. What looks smallish as a hedged position looms large in as an unhedged position. Second, it's unwise to take big positions without pretesting the risk. Perhaps you think you can stomach losing $200,000, but if the spot touches previous support (100.60), you'll be in anguish thinking, "What if the BOJ and the Fed don't support the dollar?" and won't be able to hold the position.

As often happens with people who've not experienced a particular kind of pain, my friend thought fear wasn't about him. Until the day before expiration, luck was with him. Then the night before expiration *something unexpected happened*. He received a call at 2:30 a.m. informing him that Japan's prime minister had made an announcement and the dollar had dropped from 103.00 to 101.00. Until 5 a.m., the dollar fluctuated within the 100.75–101.20 range, and then it slipped to 100.60. Neither BOJ nor the Fed intervened. By 6:00 a.m., my colleague could no longer stand it and bought the position back, losing more than $100,000. Ironically, at 10:00 a.m. New York time (the exercise time), the dollar / yen was trading at 100.90, almost the exact point of maximum profit for the strategy!

Thus, preliminary risk analysis and maximum loss targets didn't help when the situation soured, even though the spot stayed within the expected profit range. My friend couldn't take the psychological pressure when the BOJ didn't intervene, possibly because the event occurred in the middle of the night when he was out of the office and had limited information. With everything turning against him, the over-sized position size became intolerable. Had he held a minimal position during this first experiment, he might have been able to withstand the pressure.

CHAPTER 9

PLAYING DEFENSE:

ENHANCED OPTION STRATEGIES FOR UNHEDGED POSITIONS

Now we consider managing options positions during adverse markets, an important topic for unhedged positions. In general, unhedged positions seek to benefit from directional or range-bound markets. Holding non-delta-hedged positions requires all your predictive skills, and you had better be right about both the underlying dynamics and volatility. We'll discuss interaction of these components simultaneously, so this chapter may seem difficult. But managing unhedged positions is essential, and this chapter's alternatives will help reduce losses.

"Rolls"

"Rolls" are *continuation strategies* for making money or reducing losses. They involve closing existing option positions and opening new ones. For example, say you're short $1 million of the 1.3100 EUR / USD puts as the euro's current price falls uncomfortably near that strike price. You can "roll" the 1.3100 strike into the 1.2900 strike. That is, you buy back the position and simultaneously sell $2 million of the 1.2900 EUR / USD with the same expiration for zero net premium.

That maneuver is a *vertical roll*—i.e., you shift to higher or lower strikes by selling and simultaneously buying options having the same expiration. Your choice of strikes determines whether the notional of the new position is smaller or larger. Rolls can be performed for credit or debit. That is, you can take profits through a roll or invest more in your positions. A vertical roll essentially is achieved via a vertical or a ratio spread because you buy and sell two strikes at the same time.

A *horizontal roll* involves rolling an existing position into one with the same strikes but smaller notionals with longer expirations. Suppose you sold a three-week option and the underlying asset is creeping toward the strike price. You expect the market will return to the level you predicted, but you still want to have less notional risk. In that case, you can roll $2 million of three-week ATM options into $1 million of a three-month ATM option assuming the implied volatilities are about the same.

Also consider a *diagonal roll*—rolling a given strike into other strikes and other months.

Since the number of rolls is almost limitless, you can develop them according to your market outlook. Selecting rolls is like playing chess: before making a move, you contemplate possible market developments while maintaining your defenses.

Vertical Rolls

As mentioned in the example above, a vertical roll involves shifting a position from one strike price to a different strike price in the same month. Let's say you start by being long \$1 million of 110 calls. A vertical roll involves selling the \$1 million of 110s and buying \$2 million of the 120s.

In doing so you end up with different notional values of the new strike unless you alter the original investment. For instance, you can roll \$1 million of the 110s into \$2 million of 120 calls without additional investment, but if you are afraid to increase the short strike that much, you can roll into \$1.5 million of 120 calls. This roll will require additional capital because if you reduce the face amount of the 120 call, you will not have enough cash to buy back \$1 million of the 110s.

From this example you see that to execute a vertical roll you execute a de facto ratio spread discussed in Chapter 8. Therefore, the optimization analysis from Chapter 8 applies for optimizing vertical rolls. When planning vertical rolls, you must chose combinations of the positions you close and positions you open that provide the best chance of survival.

There are three especially important keys to successful directional trading with ratio spreads. The first is structuring the ratio spread (vertical roll) around the correct predicted price range of the underlying asset. The second is understanding how differentials in time decay affect your ratio spreads or the new position after the roll, compared to the old position. Third, when you execute a roll, consider your future alternatives to roll the new position, especially in illiquid or gapping markets.

Let's examine the first key to success: picking the right price range. You must roll the deteriorating position into a strike price the underlying asset won't likely reach. For instance, imagine you're short \$1 million of 110 calls. The underlying goes against you, and you decide to push the risk out by rolling \$1 million of 110 calls into \$2 million of 120 calls. Although you theoretically increase the amount of capital at risk at the distant strike price (because you increased the notional value at the new strike), you'll lose nothing if the price of the underlying asset remains within the 110–120 range.

Of course, you seldom have a chance to push the strike out to a completely safe price because you're never certain that the new short option won't be exercised. The more reasonable objective is to improve your interim situation using technical levels beyond which the market is unlikely to go in the near future.

The second key to success is understanding differentials in time decay. Its influence on ratio spreads was demonstrated in Table 8.4.The most favorable rolls require substantial time value of the position to be rolled. For instance, the new strike price you select in rolling out a one-week option will be closer to the original strike than the new strike you choose when rolling out a one-month option, because the time value of a one-week option will be substantially lower than for an option with the same delta. As you recall, time value depends on implied volatility and forward differential. When the time value is less, the strikes into which you can roll will be closer. Forward differential matters in longer-term rolls. Strike prices of shorter-term rolls will depend upon implied volatility and the time decay speed[52] of the options bought and sold.

The two key observations work well together. The roll "protects" your position since the short option has greater time decay because the notional value was increased. In such a case, even if the underlying security continues to move against you, but does it slowly, the option's price falls quickly, and it's reasonably inexpensive to later buy back the entire new position.

To understand the third key to success—let's revisit our initial example where you bought back the $1 million March 1.3100 EUR / USD puts and simultaneously sold $2 million of March 1.2900 EUR / USD puts. This vertical roll was executed as a vertical ratio spread. We know how to calculate breakeven points for ratio spreads, so we can calculate the defensive enhancement this roll provided. As a result, we know we're better off with this roll, provided EUR / USD doesn't fall below 1.2700. This roll decreases your loss horizon to the 1.3100–1.2700 range. If the option expires with the EUR / USD spot above 1.2900 (the newly sold strike), you lose nothing. If you hadn't rolled the position, you'd have lost money at any price below 1.3100.

Unfortunately, the best time to execute such a roll is when it's scariest to do so. That normally happens when the market drops or rises suddenly against your position. At such moments, implied volatility of the EUR / USD increases. For example, say the euro falls from 1.3700 to 1.3200 in two trading sessions, a precipitous drop. Implied volatilities jump. With implied volatility high when you execute the roll, you'll set new strike prices farther from the original strike than when volatility is lower. Here we use material from Tables 8.1 and 8.2 showing that higher implied volatility dictates a greater range in strike prices for the roll.

To reinforce another earlier point, let's review how skew affects decisions to roll. As you remember, skew reflects implied volatility premium for OTM puts may be higher than for ATM puts with the same expiration. Generally, skew *increases* when implied volatility increases, and that happens when the underlying security moves in the direction *opposite* its long term trend. This situation improves the volatility condition for the vertical roll since you are buying back puts closer to ATM while selling puts further OTM with higher implied volatility.[53]

Dilemmas of Rolling

As we mentioned, time value—the time remaining to expiration—is of the essence in rolls. The more time to expiration the greater the time value so, the further out you'll roll the new short strike. When you use this observation, there are many caveats to remember. For example, say you're following a short-term strategy and today is Friday. It's better to roll today, because on Monday the near-term option you want to roll into will be two days nearer expiration. Its premium will have lost time value over the weekend, weakening your defensive position. That's why when you're short near-term options the best time to defend your position is during market panic when the underlying moves aggressively against you. Remember the rolling rule: *the greater the option's time value when you roll, the further the new strike should be from the current price.*

If high volatility and skew are good for a roll, why not do a 1:3 roll and extend the short strike even further? Because the price of the underlying security may continue to decline, and implied volatility may continue to rise along with the skew. If this happens, you might do another 2 x 4 roll and still be able to stomach the drastically increased position, whereas rolling three short options into six may be more traumatic psychologically. Therefore, when you decide to employ this defensive technique, start conservatively. You'll avoid panic attacks until you have experience with the consequences of this tactic.

Psychological Caveats of Defensive and Offensive Strategies

The previous section discussed defensive strategies to reduce losses, but strategies designed to make money share many of their characteristics. Your psychological comfort throughout the process is central to employing them successfully. In other words, you must do what makes you uncomfortable if the market goes against you. Before we begin this subject, let's pause for a joke from the animal kingdom.

During a non-smoking flight a crow sitting in the front row of the aircraft started smoking. The flight attendant explained the rules to the hooligan.

"I don't care about rules," the crow said. "I enjoy showing off."

Seeing the crow go unpunished, a wolf in the adjoining row lit up a cigarette.

"Smoking is prohibited," the attendant told him.

"I know," answered the wolf, "but I also don't care about rules and like to show off."

The flight attendant reported to her pilot who without hesitation pressed a button catapulting the offenders from the plane. The crow flapped his wings, and started flying. The wolf, on the other hand, plummeted toward earth. The crow flew over to him and said: "If I were you, I'd think twice about showing off next time."

As you read this section, remember that however brave you are and however good your ideas, you must develop defensive techniques in case your view doesn't fly.

Transforming Long Positions

With the help of rolls you can make long positions more or less offensive. Let's say you're *long* two call options, each for 100 shares of stock, at a strike price of 100. The stock's price has increased quickly, and your position is profitable. You can close it out, increase or decrease it, or make several other moves. Here are some choices:

Roll the strike out and increase the position size. For example, roll to four 120 calls.

Roll the strike in (down) while reducing position size and leverage as delta increases. For example, buy one call at the 90 strike price.

Both rolls are vertical. You could choose horizontal rolls into other expiration dates with or without changing the position size or the risk profile.

As your long options approach ATM, their time value increases. The higher it is, the more rolling alternatives you have. How do you choose among these alternatives? When you expect a rapid advance to continue, consider selling the original 100 calls and replacing them with ones with larger notional value.

For example, ABC opened at $100 per share with a 30-day implied volatility of 30% (the repo rate equals the dividend rate). You bought a one-month call for 100 shares (ATM) for 3.43 or $343.00. By the end of the same day, the price advanced to 105 as implied volatility jumped to 35%. Now you could do a vertical roll, selling the one-month 100 call and buying four one-month 120 calls, rolling it 1 x 4. You sold the original for 7.07 ($707), and the cost of the four new options was 0.48 each ($48) totaling 1.92 or $192.00. The new position is larger, and additionally you booked some profit.

In these cases, due to the skew (buying OTM options) the roll will be more expensive while theta of the new position will be larger. Yet if you believe the trend will persist, you get a greater chance to gain from an increase in implied volatility, as OTM options will be more sensitive and with the larger position size will gain more gamma. The eventual results of such a roll will be positive.

If you expect the trend to continue but become less volatile, adjust your position for a decrease in implied volatility. For instance, execute a horizontal roll: sell the long option and buy another with the same strike expiring later for zero additional premium *with smaller notional value*. As a rule, short-term implied volatility declines more rapidly, so a horizontal roll reduces risk of a decline in volatility and consequently reduces risk of the option's price declining.

Finally, *if you expect the trend to continue but anticipate a correction*, reduce your position size by taking some profits.

The position size also can be reduced by a reverse vertical roll—selling back four of the 120 calls while buying one 100 call. This roll is easy if the underlying price has approached the 120 strike and / or implied volatility increased. The objective of a reverse roll is to obtain an ATM or ITM position in expectation of the market correcting. By rolling the strike in, you take some profit and reduce exposure to time decay and volatility swings. Hence, the chance to make more money increases, while the position becomes more conservative and easier to maintain if the correction occurs. The reverse roll may be efficient for taking profit and for defense. If you buy an OTM option and the market goes the opposite direction, you should roll the strike closer to increase your chance of recovery. This is a very important capital preservation point.

Transforming Long Vertical Spreads

So far we've discussed transforming a single option position—vertical and horizontal rolls on single-options positions that seek to profit if an underlying security moves in the right direction. However, you can perform similar transformations with spreads. If you're long a call and the price of the underlying instrument seemingly peaked at, say, 120, a correction or consolidation of the trend is possible. Imagine being long 2 110/120 vertical call spreads (long two 110 calls and short two 120 calls), expiring in one month, bought for $8 some time ago [$800 = ($8 x 100)], the price for the two 110/120 call spreads you bought. You want to close it for $20 [(120 − 110) x 2]. However, the market-maker shows you a bid of only $16 since the 120 call is now ATM and has $5 of time value (for two units of the notional), while both 110 calls have $1 of time value. Because of the higher time value of 120 calls, the spread seems too expensive to sell back.

Given your market forecast, you have several strategies for preserving the expected gain. For example, sell one of the long calls or roll out the short calls into calls with higher strikes. That is, sell one of the 110 calls for $11 ($10.5 of intrinsic value and $5 of time value), insuring at least a $2.5 gain (10.5 − 8) if the underlying closes below 110. You'll end up with a 1 x 2 110/120 ratio spread. Its break-even will be 132.5—i.e., {[(120 − 110) x [1 / (2 − 1)] + [(10.5 − 8) / (2 − 1)] +120}.

A second alternative is a horizontal roll of the long strikes or a variation of this strategy. Take advantage of the high volatility and roll the short strike out by buying back the two 120 calls and selling four 123 calls. Accordingly, the profitable range of your original strategy widens without taking profits. The new high break-even is 129—i.e., {123 + [(123 − 110)] x [2 / (4 – 2)] − [8 / (4 – 2)]}.[54]

If you're confident the market will be unchanged, a third possibility is to roll the two long one-month 120 calls into one three-month 120 call.[55] You sell the two 110 calls for 21 and stay short the $1 of the 120 call uncovered or hedged by the underlying.

Early in the book we were concerned that investors often prefer complex strategies, believing they offer greater profit potential. In the example above, the simplest alternative is to keep the current position or take a profit that in relative terms yields a 100% return on investment. Therefore, tame your greed *and creativity* before deciding to transform your position. Recall the advantages of keeping life simple, and pursue other investment ideas.

Transforming Short Vertical Spreads

Risk-Reward Considerations of Short Spreads

In options lingo, an investor who "sold a vertical spread" sold an option with a strike closer to the current price of the underlying asset (greater delta) and hedged the sale by buying an option with a strike price further away (lower delta). In other words, you're short the close strike and you're long the covering strike.

Traders use these spreads when they feel the market is unlikely to keep moving in the same direction. Intuitively, selling a spread and collecting 35%–40% of the distance between the strikes looks an attractive risk / reward proposition. From a standpoint of spot / cash trading, however, it sounds ridiculous! Investors in the spot / cash market insist on a risk / reward of at least 1:1.5 (i.e., chances of making money should exceed chances of losing money). Not so in options, where making 40% of the range seems reasonably rich, although you risk losing 60% of the range! In other words you risk more to make less. This is the difference between investing in long options and investing in the underlying from the perspective of risk reward. On the one hand, short options risk reward is even more startling when you recall that when selling uncovered options you have unlimited risk in exchange for a "meager" premium. This is one of the overlooked quirks of our psychology. People tend to be comfortable either with the first type of risk / reward relationships or the second. This may be why most traders excel at either selling or buying options.

Salespeople seeking "safe" strategies for clients should remember another point regarding risk / reward. They tend to recommend selling OTM vertical spreads, explaining that the short strike is unlikely to be exercised and the downside is limited. Unfortunately, investors might take larger positions when investments look "safer," thereby elevating potential for losses. This effect is opposite the one we sought in Chapter 8, where we capitalized on the greater potential gain of long OTM vertical spreads (you're long the close strike and short the covering strike).

To better understand risk / reward we must answer the question "What's the best delta combination when selling a vertical spread?" The answer depends on your market outlook. Initially, everything may seem right and then go bad, or initially go wrong and by grace of God you end up ahead.

Tables 8.1 and 8.2 demonstrated that the best combination of deltas and strikes for short vertical spreads (and ratio spreads) depends on implied volatility. At higher implied volatility, the distance between strikes of a vertical spread is greater, while the premium covers a lesser portion of the distance, especially if the short strike is far OTM. Hence, selling spreads in a high volatility environment is less preferable unless you're convinced the underlying won't march in the direction of your strategy.

Delta Hedging

It can be useful to create temporary delta hedges using the underlying asset, especially if a move occurs when your broker is out and you can't obtain a good option price. It's also useful when you need time to estimate which rolling strategy provides the best edge. Another reason is to improve the cost of your option hedge.

Consider putting on such a hedge before a weekend. Depending upon time until expiration, time decay could erode up to half the premium by Monday. The amount of the underlying hedge may be equal to the delta of a synthetically short strike or to the full size of the strike. Alternatively, buy a longer-term option, reducing time decay (but risking declines in implied volatility). On Monday, exit the temporary hedge and put on the permanent hedge.

Suppose you sold a vertical spread, the market turned against you, and you think the spread needs protecting. Having identified the adverse move early, you could hedge with the underlying asset. When doing so, remember two interconnected issues: (1) the potential for loss in a volatile market and (2) the amount of the hedge.

You're at risk when you put on an underlying asset hedge in the middle of a range. The underlying asset's price might fluctuate, and you'll lose more on it than from the time decay of an option hedge. Perhaps the best moment for delta hedging is when the underlying asset breaches an important technical level and seems unlikely to rebound. Suppose shares of Apple have broken through previous resistance. You had sold a 600/500 vertical spread for a premium. You're long two 600 calls and short two 500 calls in the direction of the move. Now your position is delta-equivalent to a 40-share short position. If you believe the *technical level is significant*, buy 40 or more shares of Apple to protect the position from loss. But remember how quickly you'll lose all the premium you received for the spread if the underlying reverts to its range and you lose money on the hedge.

As we discussed, determining the amount of the delta hedge is another piece of art, as the point at which you may decide to hedge your long option is probably OTM. Hence if the spot at expiration has not reached the strike, you'll lose on the spot hedge. For instance, if you sell EUR 1 million at 1.3000 against the 1.3200 call expecting the spot to fall to 1.2700, but the spot at expiration reaches 1.3100, you'll lose \$10,000 [EUR 1 million x (1.3100 − 1.3000)] on the hedge in addition to the loss of premium of the 1.3200 call.

Taking these two points together, you see that an underlying hedge is attractive even if hedge beyond the position's delta, but you must be certain about the likely direction of the underlying until you replace the underlying hedge with an option. The switch to the option hedge is likely to be beneficial if the stock moves against the position and approaches a new resistance level. Then you can sell the underlying and hedge using options or sell the underlying and roll 1 for 2 of the short option. In our case, you can roll the two short 500 calls into four short 600 calls, transforming from the short 2 x 2 500:600 call spread into two short 600 calls. Keeping the original spread, the maximum loss is 200 (minus original premium minus gain on the 40 stock hedge), but after the "roll" you should lose nothing if the stock trades below 600 at expiration.

Rolling Ratio Spreads

Recap of rolling

The additional economics and risk of vertical rolls are mostly the same for ratio spreads. Let's recap the principles of a ratio spread based on the previous discussion.

- The higher the implied volatility, the more comfortable it is to protect a short position by rolling the short strikes further out at no additional cost. The rolls increase position risk if the trend continues. However, if the trend consolidates near the point of the roll, the long strike will make more money without losses on the new short strikes.

- When implied volatility is low or if short-term volatility is less than long-term volatility, roll the short and long strikes to options with more time to expiration and smaller notionals.

Frequently, it's simpler to hedge with the underlying asset than with an OTM option and wait out a volatility spike, particularly in illiquid markets. For example, say it's late Friday and you must buy a short-term option. You might hedge with the underlying and try to buy the option Monday to preserve some premium against time decay.

- The greater the differences in notional values of the sold and bought strikes, the further the strikes are from each other. For instance, given the same premium, strikes of a 1:2 spread will be closer than strikes in a 1:4 spread. In this situation, two options cost the same as four.

- If in the spread (roll) will earn time decay. For example, with a 1:2 spread comprised of 30- and 20-delta options, the two 20-delta options will decline in value faster than the lone 30-delta option. However, this spread is also short implied volatility, so there's risk if implied volatility increases.

Multi-scenario Rolls analysis: Survival observations

Imagine you're long a one-week call ratio spread (long EUR 1 million 1.3800 EUR call / USD put and short EUR 2 million 1.3900 EUR call / USD put). Your risk exposure is equal to a short synthetic EUR 1 million 1.4000 "covering" call. Buying this covering call transforms the ratio spread into a butterfly, and only the premium invested is at risk. Instead, you might stay short the covering strike or alter the original strategy some other way. Check option prices to see about rolling into the butterfly in Table 9.1.

Table 9.1
Options Available for Structuring a EUR / USD Butterfly Position

Strike	Price (USD cents[56])	Time to expiration
1.3800	50	1 week
1.3900	28	
1.4000	10	
1.4100	4	
1.3900	56	2 weeks

Let's review the key points required for trading ratio spreads:

- As Chapter 8 mentioned, you can regard the result of a ratio spread at the moment of implementation equal to the result of changes in delta of the synthetic "covering" option. Thus, in our example if the 1.3800 call has a 40-delta and the 1.3900 call has a 25-delta, then a delta of the synthetically short 1.4000 call is 10%—i.e., (25 x 2) − 40.

- If all legs are executed simultaneously (legging is described in the next chapter) the price of the "covering" option is always higher than the credit from the initial ratio spread. For example, using prices in Table 9.1, the 1.3800 call costs 50 pips, and the two short 1.3900 calls produce a credit of 56 pips. The net credit is 6 pips—(28 x 2) − 50—while the 1.4000 call costs 10 pips.

Now we arrive at material that few investors understand until they're burned several times: *people dislike buying back distant strikes that seem unreachable.* Remember the availability heuristics: we're hyper-sensitive to the latest or shocking events. If the market remains in a range for two months, we figure there's little chance it will break out. If a technical level holds for several weeks, we don't bet against it getting broken. However, we know this perception is treacherous, for we have discussed brisk trend reversals. Something that looked impossible happened overnight.

Hence the following advice: *buy back part of the short strike* if it becomes cheap (if the market goes in the opposite direction or there's a little time remaining before expiration), even when it seems improbable that moves in the underlying will harm the position. *Buying back "cheap" risk is among the best rules for survival*. First, it's advisable to buy back some part of the covering strike. Second, if the underlying declines even lower, consider repurchasing one of the short 1.3900 calls, even if the underlying seems unlikely to move above 1.3800. If you do that and the euro rallies, you can reduce your long position in the 1.3800 call because you'll have a smaller short strike it used to hedge (since prior to that you bought some the short 1.3900 calls back). In fact, some insist that if any sold option loses half its value within half the time to expiration, reduce the short position even if doing so costs you money.

Let's consider eight alternatives for defending the ratio spread in our example:

1. Buy back the 2 short 1.3900 calls, sell the 1.3800 call, and collect 6 pips (28 x 2 − 50).

2. Execute a vertical roll. Buy back the two short 1.3900 calls and sell four 1.4000 calls, collecting 16 pips—i.e., (28 x 2) – (4 x 10). After the vertical roll, the position will be a 1:4, 1.3800:1.4000 USD call spread. This roll expands the secure range to the new breakeven of 1.4072—i.e., [1.4000 + ((1.4000 – 1.3800) + 16) / 3))] instead of 1.4000—i.e., [1.3900 + ((1.3900 − 1.3800) / 2)]. In other words, if the position was profitable within the 1.3800–1.4000 range, it's profitable within the new range of 1.3800–1.4072. However, after adjusting, additional risk above 1.4072 appears, equal to three 1.4072 calls instead of original synthetic short of one 1.4000 call.

3. Transform the ratio spread into a butterfly. Buy one "covering" 1.4000 call for 10 pips. The result will be a "butterfly" strategy, long one at 1.3800, short two at 1.3900, and long one at 1.4000 with a strategy risk of 10 pips, the amount paid for the 1.4000 call.

4. Roll the risk out further. Buy one of the 1.4000 calls financed by selling two of the 1.4100 calls for an additional debit of 2 pips [10 – (2 x 4)]. This results in a butterfly plus a short 1.4100 call. The short call and the premium paid comprise the risk.

5. Make a horizontal roll by buying two one-week 1.3900 calls and selling one two-week 1.3900 call. This strategy reduces the position risk through its smaller notional value, extending the length of the short period. Consider this when the implied volatility curve is inverted and near-term options are selling at a lower implied volatility.

6. Next is a simultaneous horizontal roll of both strikes into a later expiration with a decrease of the position size.

7. A more complicated adjustment is a simultaneous vertical roll of both strikes. When volatility is high, roll them up into a 2:4 spread. Position size position and risk will increase greatly, but if the volatility skew shrinks and the level of

volatility declines, the net shorts make money on both volatility and time decay. In fact, the short strike is likely to lose so much of its value that a reverse roll or buying back part of the short position may be possible. Alternatively, buy it all back while selling a part of the longs to finance the purchase.

8. If time decay has been earned due to the difference between the rates of time decay of the short and long strikes, and if the market moved sharply in the opposite direction from the strikes, sell a EUR 0.5 million 1.3800 EUR call / USD put and buy back one of the short EUR 1 million 1.3900 EUR call / USD put. The reduction will cost nothing as the premiums will be 56—i.e., (2 x 28)—and 50. This will reduce position size and risk.

Further Psychological Observations

The outline of alternatives for adjusting spreads makes it obvious there are many alternatives. When the market goes crazy, with brokers holding prices back and rumors flying, investors can feel like a commando on a night battle. At this point, you ask "Why do we need all these rolls?" The answer is, "If you're in a losing position and don't want to close it and book the loss, you must defend it." Remember even when up buying back the closing strike at a substantial debit, there's a fair chance the price will return to the range and your position will make money.

It's exhilarating when on the night before options expiration the underlying reverts to the middle strike where your position is at its maximum value. Yet that experience should convince you just how extensively serendipity drives fortune. If the market can move sufficiently to extract you from losses, it also can destroy your gains. After experiencing that revelation, you might decide thereafter to buy back your cheap shorts in the future.

Another piece of risk management advice: since a defensive roll may occasionally double the portion size of your initial strategy, *size your initial position to half its optimal size.* Then when a defensive roll doubles the size of the short position leg, a defensive roll will be easier. Test this style of trading using partial rolls like the one in alternative 8 above. With experience, you'll become more comfortable with defensive rolls.

CHAPTER 10

LEGGING IN RATIO SPREADS AND BUTTERFLIES

Tame greed and creativity is the motto of this trading technique. That's the essence of risk management alongside another principle: your best hedging opportunities occur when you're scared. Managing psychology isn't the only way to defend your positions. We've already seen that the most powerful defense of non-hedged positions is rolling. This chapter discusses another risk-reducing technique: "legging in"—constructing positions in stages. By assuming initial extra risk you reduce risk going forward if your forecast is correct. Legging in illustrates that *you can't reduce risk without taking risk*. That differs from the truism that *you can't make profits without taking risk.* As always, extrapolating what you learn in this chapter to investing generally may allow you to trim positions in non-option investments while earning equivalent profits. That was the unexpected byproduct when your author developed this technique.[57]

Legging in Ratio Spreads

You can create ratio spreads in a single trade or by "legging" into them. That is, instead of simultaneously creating positions composed of two options, you first sell an option, creating a short position, and then after the underlying goes your way (retraces from the level where you sold the option) you buy a long one. You also can leg in the other way around. For instance, you sell $2 of the 100 call when the underlying trades at 95, and when the underlying drops to 94 you buy $1 of 98 call. Sometimes constructing positions that way is cheaper.

Most investors try to guess the date and price where a trend will end and then go short options (take the short legs). Often they go short at a price point in the direction of a trend that's headed toward a technical consolidation. Sometimes the entry price looks attractive after the underlying's price accelerates through stop-outs. That's when commentators start claiming the sky's the limit for a stock (bull trap) or that there will never be a reason to buy any stock ever (bear trap). That's also when chances favor legging in a ratio spread by selling low-delta OTM options in the direction of the move.

As you remember from our discussion of options mechanics, three weeks is the optimal time to expiration for a short ATM (slightly longer for OTMs), because that's when premium amortization accelerates. However, technical levels and the slope of the forward curve primarily determine how distant the strike should be from current levels. The least dangerous options to short, as you recall from our discussion of OTM options without intrinsic value, are those with deltas between 20% and 25% because their prices will erode rapidly, particularly if they expire in three weeks or less. For example, you might leg by selling a 20-delta option and, after the underlying rebounds, buy an option with a delta closer to ATM.

Building Butterflies

Credit Issues

You face complexities when building a butterfly (some call them "butterfly spreads"). Chapter 8, "Vertical and Ratio Spreads," didn't mention that you face lack of money to buy the covering strike so that all three legs come at zero net cost simultaneously. In other words, the premium you receive from selling the calls will be less than the sum of prices you pay for the calls with the lowest and the highest strike prices. That's one reason why you should conserve capital by legging rather than purchasing all legs simultaneously.

For instance, suppose you first sell the middle strike and, after the underlying market turns your way, you buy the close strike. Then the underlying consolidates for a while, volumes fall, and your remaining credit was enough to buy the covering strike. Let's say you sell two 120 calls at 21 cents, receiving $42 in premium ($0.21 x 100 = $21 x 2 positions = $42). Then when the underlying declines, you buy one 115 call for 30 cents ($0.30 x 100 = $30). That leaves 12 cents ($12) to buy one 125 call. All three options in the butterfly have the same expiration. If the market goes against you doesn't materialize, you can still buy the covering strike, but you'll incur a debit building the butterfly.

Another choice is to collect a ratio spread credit that can be used to protect a future position or pocketed as a profit. Table 8.3 presented several possibilities for determining "covering" strikes. In that example, our strategy was long $1 million at 33 and short 34 million at 34, and buying $3 million of the $34.33 call was the covering position. If it seems unlikely the underlying will reach this level, you can buy less than $3 million of the $34.33 calls and run an incomplete butterfly. Or you can do other combinations. When selecting the "close" and covering strikes, your choice isn't limited to the distance between the close and the middle strike as well as the notional value.

Legging Considerations

Let's reexamine the buying sequence for building a butterfly spread. We've described a three-stage process: (1) sell an OTM option in the direction of the trend (the "middle" strike), (2) buy a close strike (3) buy the covering strike. Other alternatives are possible.

Buying the close strike hedges most of the potential losses from the "middle" strike. Besides, the missing low-delta covering options depreciate rapidly. Therefore, if the price of the underlying takes several days to consolidate, the price of the covering strike erodes. Generally when you're engaged in short-dated options, the covering option loses much of its time value over the weekend, if the underlying doesn't move.

However, as mentioned, you can start by buying the close strike if you expect implied volatilities to increase because you expect the underlying to return to the brink of the range. If it does, you can sell the middle strike while simultaneously buying the covering strike later.

The third legging strategy is to execute a vertical spread, and then sell another vertical spread if the move continues. For instance, you buy a 100/110 call spread 1:1, and after the underlying moves toward 110, you sell another call spread this time a 110/120 again 1:1. The result is a 100/110/120 butterfly 1:2:1.

Intellectually Attractive Range-bound Strategies

All these examples show ways to build a strategy that maximizes profit in range scenarios. However, a butterfly spread is difficult to adjust after it's in place since you won't know the results until expiration.

To increase the certainty of profiting from correctly forecasting moves in the underlying asset, you can leg into strangle-like butterfly structures. Since investors prefer simple strangles, they usually wait for an extreme move to one side of a range and sell an OTM option in that direction. Then they await a move to the opposite end of the range and sell the other option in that direction.

Such an unhedged strangle may seem safe, but it doesn't guarantee making money. Having seen clients burn huge amounts of money, I suggest that conservative investors avoid trying to leg into strangles. This is especially relevant for current markets, which allow insufficient probability for outlying events that could be devastating (thin tail risk).

There's another way to capture both ends of the range you predicted for the price of the underlying asset: leg butterflies in both directions with the two close options placed in the center of the range like a straddle (or if you don't have enough credit as a narrow strangle). In other words, instead of just selling a single 110 /120 strangle you sell 2 of them and buy a single 120 straddle. This variation tends to work for medium term positions by capturing relatively broad range.

Intellectually attractive though this strategy is, it has four drawbacks. First, while constructing the position you don't receive much credit. If the range is broken, you must buy the missing leg at a debit, and if the price of the underlying keeps running, your "beautiful" strategy may end up out of the money. Second, you make no money if the price of the underlying at expiration stands near the center of the range. Third, skews and market-maker spreads don't allow you to adjust strikes and amounts once strategies are in place. Fourth, these strategies require your constant attention for a long time.

Here's another cautionary note. A doubtful premise underlies both range-bound strategies: if you're certain you won't get burned selling OTM options or are sure you've guessed the range correctly, why not simply trade the underlying asset! Although this approach isn't exceptionally risky, is easily managed, and offers attractive risk-adjusted potential, its disadvantages hearken back to our earlier point that path-dependent strategies (the composition of butterflies is an example) are less successful than commonly believed because figuring the range, timing, and exact position isn't an endeavor with a high probability of success.

Additional Points to Remember

Avoid Over-complexity

Many traders try to be fancy by creating some "state-of-the-art" multi-legged hedge position. At the next step they can't figure out what to do with those legs, and after that they can't figure out what to do with *all* the legs. So they end up hedging their hedges.

Hedging hedges is a scary experience. If you catch yourself thinking about these complex, multi-legged strategies, you've entered fancy land. Increasing risk into a fast-moving, volatile market is certainly not a mainstream risk-management technique. Imagine a trader with a short position telling his risk manager that he was so scared he decided it was a time for a huge increase in value-at-risk) because he expected he‘d “reduce” risk substantially when the market rebounds. That idea is so foreign that the risk manager will think the guy is cooked.

Taxes and Commissions

We haven’t discussed tax consequences and commissions incurred in trading, but they’re important if you trade frequently. Although commissions are easily calculated, taxes are a less predictable proposition. It’s best to put on small trades and then consult your accountant. Accountants usually can’t give even an approximate answer unless they can see your specific situations. Remember that these strategies may have different tax consequences for different underlying assets.

Over-reliance on Luck

Studying the techniques in this chapter crystallizes your realization that your investment ideas may depend excessively on luck. You may initially love strategies that end up causing sleepless nights, or the market stops where you expected and you fell that you conquered the world, while both events are to large extent issues of luck choosing or not choosing the path you foresaw. Most investors understand the importance of luck, but few internalize their understanding. Others have a greater desire to develop all the tricks of trade.

Nonetheless, rational arguments and correct calculations are sometimes subordinate to luck, as this old story suggests:

A rabbi heard someone knocking on his door. He opened it, and there stood a member of his synagogue, pleading, "Rabbi, lend me some money, please. I have a great idea, and if it works out, I’ll donate a lot to charity."

The rabbi said wearily, "I cannot, as many before you have borrowed from me already.” But seeing the man was insistent, he added, “I suggest you buy a lottery ticket with the number 58. I'll pray for you to win.”

A month later, the parishioner returned with a donation, exclaiming, "Rabbi, I won the lottery! How did you know the winning number?"

"That was simple: you came on the seventh day of the month at 8 o'clock. Multiply seven by eight and you get 58!"

CHAPTER 11

OBSERVATIONS ABOUT BASIC STRATEGIES AND PROBLEMS OF OVERTRADING

Because the high-intensity environment of directional trading requires refinements that are less germane to trading delta-neutral positions and for basic hedging, we will now discuss pros and cons of several basic strategies. Although simpler strategies seem mundane, sophisticated strategies are harder to manage. Investors often progress to managing complex strategies and then after being burned come to appreciate the value of simple strategies. After doing the full circle they sharpen their mastery of simple strategies by applying refinements developed for complex strategies. Many of them we'll discuss in this chapter.

Straddles

Textbooks recommend buying straddles when you expect a big move in price of the underlying asset and holding them *until* expiration. However, that is a limited application of long straddles. In practice, the expected move rarely exceeds the break-even point. Therefore, consider buying a straddle only when you plan to sell it at a profit *before* expiration.

Straddles usually become profitable before they reach breakeven points[58] prior to expiration because implied volatility increases and one of the legs goes ITM. Be sure to take a moment to price straddles of different maturities to get a sense how much they appreciate as the underlying moves. Investors who trade delta-neutral positions often have intuitions about the gamma of straddles but pay little attention to their price appreciation.

Long and Short Straddles

A long straddle makes money when markets are volatile within a narrow range, as long as the volatility provides many chances to re-hedge positions with the underlying. Re-hedging allows you to sell some hedge high and/or buy some of it low, making money while the underlying is volatile. In this situation, re-hedging makes the strategy profitable even when the price of the underlying doesn't exceed the breakeven points.

Short straddles are best when expectations for a substantial move in the underlying are low, along with the expectation of declining implied volatility, or alternatively when hedging opportunities are cheap (for instance, when the market is volatile intraday but opening and closing prices are similar). In this case, losses from re-hedging are limited, and the seller retains most of the premium. Although hedging using the underlying isn't our focus, it can be easier, and we prefer simple solutions, especially for complex issues. Hedging straddles with the underlying is a simple solution.

An additional speculative element exists by selling an ITM straddle when the market remains at an extreme technical level when implied volatility often rises. The strikes should be positioned in the middle of the normal range. So when the market returns to its mid-range implied volatility will usually decline and the strategy will gain from delta and time decay. These three factors will prompt a decline in the price of the sold straddle.

Straddle Price Depends on Proximity to the Current Forward

If the forward curve is flat, a straddle is least expensive when the underlying trades at the strike price because there's only time value in the ATM straddle, not intrinsic value. If the forward curve is not flat, you must make adjustments. In fact, for foreign exchange OTC options, where the convention is to trade ATM forward options, the straddle is cheapest when the forward price after the swap point equals the strike price. For example, say that at some point the one-year USD / JPY forward traded at −300 pips (3 yen). That −300 pips is a forward differential, also called "a swap point."

You bought a one-year 85.00 USD / JPY straddle when the spot was at 88.00 (88.00 − 3.00 = 85.00). The price fluctuated within the 85.50–90.50 range for six months, at which time you decided to sell it when the spot traded at 86.50. The forward curve did not change—i.e., in six months half of the −300 discount accrued. However, on that day news broke as you pondered closing the position, and the market seemed about to move up sharply, possibly even to 89.00, within one or two days. Volatilities escalated. Should you close the straddle or await the move?

The six-month forward is now 150 yen-pips below the spot price (half the term has passed, and half the original discount has accrued). That means if the spot is 86.50, then the 85.00 straddle is at-the-money. Hence, at 86.50, the price of your straddle is at its minimum, and you should wait until the spot moves far from 86.50.

Strangles

Observations about straddles also apply to strangles. However, since strangles when initially opened are mostly composed of OTM options, investments in them respond more to changes in implied volatility than do equal investments in straddles. Since changes in implied volatility significantly affect investments of longer-dated options, it's best to sell strangles at the end of a substantial price move in the underlying asset when implied volatility is high.

When buying strangles, remember they're more difficult to hedge than straddles. First, the amount of the hedge is smaller, as the options have lower deltas and gammas. Second, if the price of the underlying remains in the mid-range between the strikes, their deltas will start declining, and your ability to hedge dwindles even more. As potential for re-hedging with the underlying declines, so too does the possibility of gain. Third, when hedging OTM options, you essentially open a speculative cash / spot position that's unprotected by an option. For example, you buy a 110 OTM call and sell a hedge at 105. If the underlying price jots 109 at expiration, your hedged position suffers both from losing the premium and losing on the underlying asset between 105 and 109.

The strangle price dependence on the proximity of its strike price to the current forward is similar to straddles. The closer the strangle price [(call strike + put strike) / 2] is to the arithmetic center of the current forward, the lower is the price. For example, you buy a one-year 82.00–90.00 USD / JPY strangle. With the current forward at 85.00, the deltas of the 82.00 USD put and the 90.00 USD call are unequal. They would be equal if the forward price coincided with 86.00—the arithmetic average of the options' strikes [(82.00 + 90.00) / 2].

For example, the price fluctuated within the range of 78.00–89.00 for six months. After six months, you decide to sell. That day the spot was 87.50, and you expected it to decline to 86.50 by the market close. You want to know which spot level is the best for closing the position.

The six-month forward price trades at 150 yen-pips below spot. When the spot is 87.50, the forward is 86.00 and occupies the center of your strangle. At 86.50, the forward will be 85.00, which is further from 86.00, the center of the range so it's more expensive.

Defending Iron Butterflies

We could discuss many ways to hedge straddles and strangles, but the chapter would become repetitive. So let's use hedging iron butterflies, which consist of long straddles and short strangles (or vice versa) as a single illustration. We begin with a few observations.

The techniques in previous chapters will help to manage positions, but they might prompt you to overtrade by repeatedly adjusting your hedges. That problem also arises whenever you think about creating a new position every time the market touches a strong technical threshold. This may lead to a common problem: executing every available trade and ending up with positions opposite those you intended or positions too large, convoluted, and difficult to manage.

Before we start, here's a story.

> Yitzhak came to the rabbi with a problem. "Rabbi, I have two geese, a black one and a white one, but I'm hungry! What should I do?"
>
> "Yitzhak, did you not think whether you could eat the white goose?" the Rabbi asked.
>
> "I can't," Yitzhak insisted. "The black one would miss the white one."
>
> "What if you eat the black one first?" asked the Rabbi.
>
> "I can't," Yitzhak repeated. "The white one would miss the black one."
>
> "Why not eat both?" asked the rabbi.
>
> "Then I'll miss them both!" cried Isaac.
>
> The rabbi thought for a moment. "Your problem requires a different approach. There's church across the road. Father Fyodor is a wise man. Go ask him."
>
> Yitzhak went to Father Fyodor and explained his problem. "What if you eat the black goose?" asked father Fyodor. "I can't," said Yitzhak. "The white one will miss the black one."
>
> "Then eat the white one!" said farther Fyodor. Yitzhak started to answer that the white one would miss the black one, when father Fyodor interrupted: "So? Hell with it!"

The moral is "Don't overcomplicate it." Here's a recommendation that countless men have heard from girlfriends and wives: "You need to feel my (the market's) desires." Feel the right action rather than over-think, or a valid process tend to become mired in needless complexity.

Let's demonstrate this point by using an example of managing an iron butterfly. An *iron butterfly* is an options strategy with four legs, and you generally use it when you expect an underlying asset to trade within a range. It consists of selling a straddle while buying a strangle to prevent losses, if the underlying breaks beyond the expected range, and it's clearly difficult to manage.

In general, the risk / reward ratio for the seller of an iron butterfly is 2:1, as the credit comprises about 30% of the range between the short and long strikes. Legging in this strategy may boost its odds of success: first sell the OTM options, wait until the market cools, and buy the ATM options. If the market keeps moving after selling the OTM legs, optimization is possible. For instance, readjust the center of the iron butterfly to fit the new market.

On Friday, October 12, you put on an AUD / USD (Australian dollar / US dollar) iron butterfly. The spot price is .9590, and expiration is October 20 (Table 11.1).

Table 11.1
Original AUD / USD Option Position

Strike	Option	Notional	Premium ($)
.9520	AUD put	+1.0 million	1,700
.9615	AUD put	−1.0 million	−2,900
.9615	AUD put	−1.0 million	−5,300
.9670	AUD call	+1.0 million	1,200

While the spot was .9590, the iron butterfly was not centered in the range, so the strangle is not symmetrical around the center. The asymmetry reflects your view of where the spot price likely will end. It also generates a larger initial credit, as the straddle is more expensive if its strike is further from the forward to the date of the straddle's expiration. The maximum value of $5,300 occurs if the spot is .9615 at expiration. The maximum loss is $4,200.

Say that on Wednesday, October 17, the spot drops to .9520 and you roll AUD 1 million of the short .9615 put into AUD 2 million of the .9560 put at no cost. This adjustment lowers the original breakeven to .95335 [.560 − (.0053 / 2)].

The roll improves the position compared to the initial short strike of .9615. However, it creates an additional short synthetic position—an AUD 1 million .9505 put. Now your maximum loss exceeds the initial $4,200 [1 million x (.9562 − .9520)] if the spot falls below .9505.

Then the spot moves again, and you do a few more adjustments, ending up with the position in Table 11.2.

Table 11.2
Restructured AUD / USD Option Position

Strike	Option	Notional
.9520	AUD put	+1 million
.9615	AUD put	−1 million
.9615	AUD put	−1 million
.9670	AUD call	+1 million
.9670	AUD call	+1 million

Total credit on the trade:	+$5,000 (maximum gain at .9560)
The break-even point:	.9537 −.9610
Maximum loss:	−$6,000 on the upside
	−$4,900 on the downside

The adjustments seem sound because its center of profitability is .9560 (Table 11.2), which corresponds to the new strong resistance on the graph. However, the number of strikes also increased, and the position is much more complicated. Sometimes such complexity is warranted, but in this case the thought process and the result lead to overtrading.

CHAPTER 12

Other Defensive and Offensive Strategies

Horizontal Spreads

Selling short-term options and buying *longer* options works in the following situations:

- Sell short-term and buy long-term options when the former trade at high-implied volatilities and volatilities on the latter remain relatively low.

- Consider horizontal spreads for event trades. For example, big currency moves often follow G8 meetings, just as stock prices may move after earnings reports and directors meetings. It's sensible to sell options expiring before such events and to buy options expiring after the event when the implied volatility is expected to decline.

- If you invest in delta-neutral hedged positions and expect significant increases in implied volatility, sell short-term options and buy hedged long-term options. Market-makers and investors engaged in volatility arbitrage call such positions short gamma-long vega,[59] because price changes in the underlying asset influence premiums of short-term options more than longer-term options.

Consider purchasing shorter-dated options in the following situations:

- When the previous trend flattens, price changes become more predictable and the implied volatility of the shorter term options decline However, in these situations the implied volatility of options with expirations exceeding two months remains only marginally lower than before, as the market frets the trend may resume. In that circumstance there may be an opportunity to sell medium-term options at higher implied volatility. For example, buying a straddle or a hedged one-week option and selling a one-month or a two-month option is an example of a *long gamma-short vega* position. Hedging the spot price successfully is important because short-term options have significant time decay. You need dynamic hedging to pay for time decay while expecting to make money from the short vega.

- You doubt the forecast that a given event will produce substantial moves in the underlying asset with increasing implied volatility. Thus, you sell long-term volatility and hedge by buying shorter-term options. Volatilities will increase if the market becomes nervous after the event, so re-hedging will help to reduce losses from the greater implied volatility.

- You'd like to sell more of the expensive long-term options, as the market has reached the extreme of a technical range (below a key resistance level or above an important support level). You plan to gain more from the decline in implied volatility of the long-term options than you lose from the decline in the short-term options while gaining from their higher gamma. Even if the technical level is broken, the gamma from the short-term options will hedge some losses from the heightened longer-term volatility.

Here's another practical comment on timing vertical spreads. If you've traded options on many underlying assets, you perhaps noticed that the long-term segment of the volatility curve spikes noticeably as the end of an abrupt trend approaches. We're talking about the end of a three-to-six month trend like those with 50 + degree angles on the charts. At some point, normally during the third or fourth consolidation, the volatility curve flattens, because longer maturities increase for no obvious reason. That's when shorting them makes sense, but you must hedge your position with shorter-term options. These moments happen rarely, but this strategy seems to have worked for the past 20 years.

Finally, it's often overlooked that the long-gamma short vega spreads can be achieved through both horizontal and vertical spreads.

Combos (also called Collars, Cap-and-Floors, Risk Reversals, and Tunnels)

A combo is suitable if you anticipate a future direction but are unsure where the movement will start. In this case, traders buy a combo rather than the underlying asset. A position in the underlying would lose if the market goes against it, but the combo doesn't lose as long as the market remains above the strike of the option sold.

Choosing Strikes

Strike positioning is crucial. As Table 12.1 shows, the greater the delta, volatility, and time to expiration, the further the OTM option strikes are from the ATM strike. Suppose you sell a 20-delta put as part of a combo. If implied volatility increases from 20 to 30, the put's strike will decline from 47.72 to 46.69. Simultaneously, the premium you collect will increase from 4.55 to 6.63. As we noted before, the payout of vertical spreads (relationship of price to the maximum profit) increases as volatility increases with longer term spreads.

Table 12.1
Relationship of Strikes and Premiums to Implied Volatility,
Delta, and Time to Expiration

Time to Expiration		**30 days**				**90 days**			
DELTA		20%		30%		20%		30%	
VOLATILITY		Strike	Premium	Strike	Premium	Strike	Premium	Strike	Premium
CALLS	20	535.04	3.17%	525	5.39%	556.11	5.39%	538.86	9.14%
	30	549.24	4.69%	534.46	7.97%	583.43	7.90%	556.5	13.37%
PUTS	20	47.72	−4.55%	48.6	−2.81%	46.22	−7.55%	47.69	−4.62%
	30	46.69	−6.63%	47.97	−4.06%	44.61	−10.78%	46.75	−6.50%

Several strategies take advantage of relatively high-priced puts. For instance, if you fear the market will retrace a bullish trend, sell a put that's further OTM although with greater notional for the same premium over the put with the higher strike (and smaller notional). This choice reduces the probability of loss or assignment if the trend retraces. However, its outcome will be worse if the retracement actually begins a bear trend. Conversely, buying a put using a higher strike (closer to the money) is relatively less expensive in implied volatility terms, has a higher delta, and is more likely to make money or to hedge other long positions more efficiently.

Combos for Taking Views on Implied Volatilities

Traders often use combos when trading implied volatility, but it's important to mention a peculiarity of volatility trading. When the trend has been bullish for a while with an angle around 50 degrees and expectations for a price reversal begin increasing options with strike prices in the direction opposite the trend start trading with higher implied volatility.

This phenomenon seems to be present in most markets with actively traded options, because investors are long or short the underlying in the direction of the trend and hedge it with OTM options in the opposite direction. When long the underlying, they may buy OTM puts and finance them by selling OTM calls, creating a collar. As a result, skew develops or becomes more pronounced, and OTM puts trade at higher volatilities than OTM calls.

Market-makers know that when the trend changes, skew will become more obvious as more put-buying lifts prices, reflected as an increase in implied volatility. At these turns, they are positioning for positive gamma (increase in delta available for re-hedging) on the downside, expecting the market in the underlying to become more volatile. They expect to make money both from re-hedging positions and from higher put implied volatility.

Defending Range Forward (*also known as a Collar or Combo*)

The repertoire of aggressive and defensive actions is broad. Suppose the EUR/USD advanced sharply (dollar fell sharply against the euro), and you believe dollar's recent collapse completed a long descending trend. Instead of buying the dollar, you put on a risk reversal trade (collar), buying OTM dollar calls (EUR put) and selling OTM puts on the USD. You chose this strategy because it seemed safer than a long position in the underlying in case the descending trend continues. Suppose your timing is right and over three days the EUR/USD declines (dollar appreciates) to a previous important technical level. What alternatives do you consider?

1. Totally or partially close the strategy and take profits.
2. Buy back a part of the short position.
3. Sell part of the long strike.
4. Sell an option with a greater notional value against the long strike, collecting the premium.

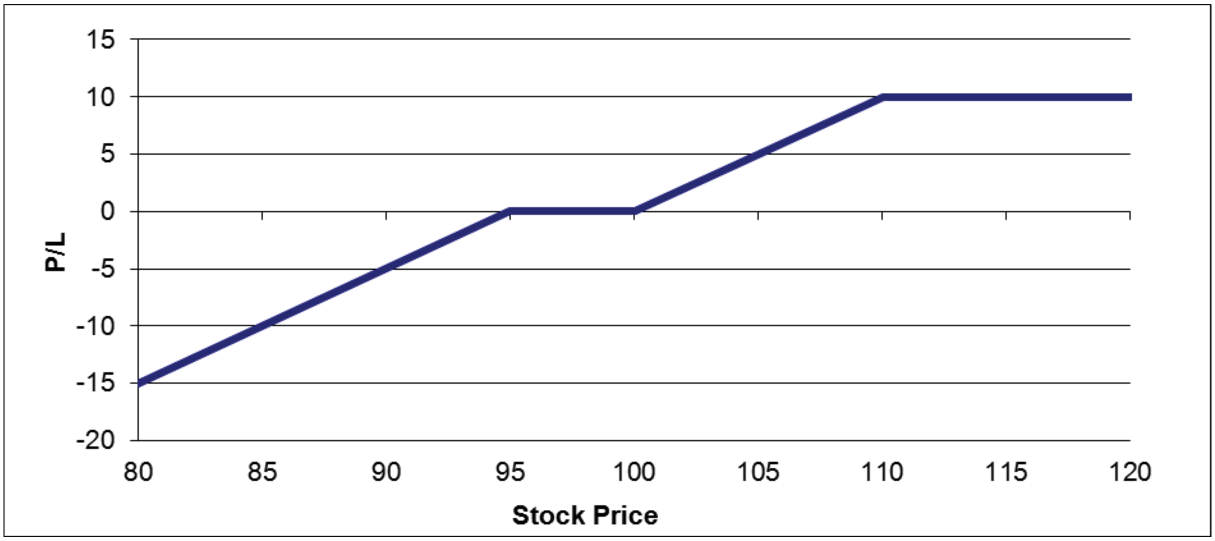
5. Buy an option with a smaller notional value but a strike near the current level to hedge the short leg of the range forward.
6. Execute a reverse vertical roll of the long strike, reducing the position but increasing its chance to be in the money if the market bounces off resistance.
7. Roll the long strike up, increasing the notional value with a credit (partial profit-taking) or at no credit.
8. Combine any of the above strategies in both directions.

Seagulls

The seagull is a popular, inexpensive, and sometimes even premium-cost-free strategy that combines features of a combo and vertical spread. Here's an example of the thinking behind its application (Figure 12.1). Expecting Goldman Sachs to appreciate from \$100 to \$110, you could profit from buying the stock or a call spread. Say you have \$1,000, and a three-month 100/110 call spread costs \$3.33 (\$333). You can buy 10 shares of stock or three call spreads.

While options provide obvious leverage, if three months passes and the stock price remains unchanged you will lose the entire amount invested. To reduce that risk you can sell a \$95 strike put for \$3.33 (\$333). By matching the put's expiration with the expiration of the long call spread, you create a seagull (long 100/110 call spread and short 95 put) *at zero cost*. In addition, because of the normal implied volatility skew mentioned above, the puts are relatively more expensive in implied volatility terms than the call spread, which adds some edge to the position.

Figure 12.1
Risk Profile of the Goldman Sachs Seagull



However, the risk inherent in this seagull is that the stock closes below $95 at option expiration. If so, you're assigned 300 shares at $95. You had $1,000 to invest and now need $28,200 to cover the purchase. Buying at $95 isn't a problem if you were prepared to buy the stock at $100. The problem is that if you change your directional view, the option position can be less liquid than the shares, and closing it might be more challenging than changing the position in the underlying. Again, options positions that are "free" and "sophisticated" in easy times become pressure-laden in tough times. Defensive and offensive strategies with seagulls resemble those of spreads and risk reversals.

Consider a further point when determining position size. When shorting the put you must post margin, and in many markets that margin might be less than the margin requirement to buy the stock. Nonetheless, your $1,000 might be insufficient for applying the strategy because of the margin requirement.

Profitability of Options Strategies

You often hear questions about how to calculate profitability of option strategies. When buying an option or a spread, the answer is straightforward: the gain or loss is based upon the amount of premium invested. For a seagull, net cash cost isn't appropriate, since it was zero. In this situation, use the margin requirement as a proxy for required capital to approximate return on capital. Although it changes as options prices change, making an accurate return on investment calculation difficult and banks and brokerage firms often have different margin requirements.

CHAPTER 13

STRATEGIES BASED ON FINANCING RATES

This chapter examines options and financing rates. Interest and dividend rates generally aren't crucial in options trading, but the 2007–2009 crisis demonstrated that they can present concerns. Financing rates also are important when you're trying to profit from differences between American-style and European-style options.

Recap of Chapter 2

Remember, the simplified share price forward calculation is:

Current price x (1 + financing rate) / (1 + dividend rate).

Thus, as interest rates increase, the cost of financing shares, (the forward) increases, and a delta of a purchased call increases. If the dividend rate increases, the forward rate declines and call prices decrease.

If you're selling calls, interpret the formula above this way: You might collect dividends on shares you bought to hedge. The smaller premium available on the calls reflects that you'll not earn dividends on the stock. If you buy a call, borrow the stock, and sell the stock short to hedge, you must pay the dividend on the stock you borrowed. The call price should be lower due to additional hedging expenses—this time, the dividend cost. Along the same line, financing costs are higher if you finance your purchase of shares and interest rates rise. The higher call premium adjusts for the increased funding cost.

Influence of Repo Rates & Dividends on Option Premiums

Table 13.1
Correlation Between REPO Rates and ATM Option Premiums on Gazprom Shares

	CALL					**PUT**				
Days to Expiration	30	60	90	180	365	30	60	90	180	365
	PREMIUM					PREMIUM				
REPO rate = 0%	1.14%	1.62%	1.98%	2.80%	3.99%	1.14%	1.62%	1.98%	2.80%	3.99%
REPO rate = 3%	1.27%	1.87%	2.36%	3.58%	5.58%	1.02%	1.38%	1.63%	2.11%	2.63%
Difference in prices of options and REPO rates					1.59%					−1.36%

Table 13.1 shows two basic correlations between REPO rates and option premiums. First, rising REPO rates increase call premiums and decrease put premiums. The inverse is true for dividends: rising REPO rates increase put premiums and decrease call premiums. As an old saying puts it, “Interest is in the calls, dividends are in the puts.” It’s also important to note in Table 14.1 that premiums change in direct proportion to changing REPO rates and option deltas.

Influence of Forward Rates on Option Delta

You use different interest rates to calculate premiums of options on different underlying assets. For instance, currency options use the rate of the respective currency, whereas equity options use REPO and dividend rates. Let’s examine the influence of rates using an example for currency options. Remember that OTC foreign exchange options use forward strike prices, whereas single stock options use spot strikes.

In the FX market in almost any currency pair there’s a differential between interest rates that can be earned on deposits in those currencies called the “forward differential.” As we remember from the put / call parity, the forward differential influences the position of ATM options’ strike prices.

Before considering an example using a one-year USD / JPY option, let's review how the forward curve works with currency options. Not long ago, USD interest rates exceeded JPY rates, and the forward USD was quoted at a discount. That is, the USD / JPY forward rate was below its spot rate—say 95.00 and 100.00, respectively. Thus, the forward differential (the difference between two currency interest rates) was negative. The quote from a forward dealer would then be (−500 / −499).

To buy a one-year dollar call when the spot price is 100.00, the ATM forward strike for a year one-year option is 95.00. Assume you buy an ATM (forward) USD call and interest rate curves for both currencies don't change for six months. What is the forward differential at the end of six months if there were no changes in rates? Answer: (−500 / 2) = −250. If the spot also remains at 100.00 for six months, the forward rate rises by 250 basis points to 97.50. Consequently, the 95.00 call appears to be 250 pips in the money!

This relationship occurs with most underlying assets, especially commodities, and has many applications. For example, if you bought a one-year 40-delta USD call, its strike would be around 100.00 (the ATM strike is 95.00). In other words, its strike would be at the spot current price. At the same time, the strike of a one-year 40-delta USD put would be almost ten figures (10 yen) lower at around 90.00.

Given the same implied volatility, option strikes with similar deltas (moneyness) should be symmetrical around *the forward rate* rather than the current spot price. Consequently, the put and call strikes should be equidistant from the forward rate of 95.00 (not from the current spot rate of 100.00)! As time passes, the delta of the 100.00 call will approach 50, while the 90.00 put will move further OTM. The spot doesn't need to move that far in the direction of the call to make the call profitable, but it must work hard to reach the level where the 40-delta put makes money, because the forward differential is working against that option!

In the late 1990s, at the time when the interest rate of the dollar was high and that of the yen was low, it was rumored that managers of a large fund sold 10-year 30 delta USD (USD / JPY) puts. They likely chose that strategy based upon considerations we just discussed. The spot was trading around 120.00 while the corresponding to the 10 year forward rate was lower. As a result the put's strike was significantly below 100.00. As the shorter-dated interest rate differentials were smaller and shorter-dated volatilities were lower as well, with each year the option was becoming significantly less valuable. This dynamics would accelerate if US interest rates were to fall or Japanese rates were to increase. You see a similar situation in the commodities, when the forward curve is in steep backwardation.

Influence of Changing Interest Rates on Option Prices

As options approach expiration they may become more in the money not only because they're evaluated against a shorter-term segment of the forward curve but also because the shape of the forward curve changes. Events of 2008 illustrated the importance of the forward curve for currency options prices (Chapter 2). By December 2008, the ruble had dropped 30% from its high. However, six-month forwards went out another 30%, and OTM USD calls, which were far out-of-the-money at the beginning of the ruble's decline in the autumn of 2008, went in-the-money by year's end. Among longer-dated options, even-greater portions of the price and delta adjustments were due to forward rates, not the spot. The same happens with precious metals and energy options, where forward prices often fluctuate more than the spot price.

Let's review how changing forward rate differentials affect option prices. Look again at our example of buying a 95.00 USD call when the forward differential was 5.00 yen (−500 pips). On the same day it rose to −600 pips. If you bought an ATM USD call after the change in forward differential, its strike would be 94.00 (100.00 − 6.00). If you bought the 95.00 USD call before the differential change and the ATM strike after the change was 94.00, then the 95 call is out of the money and its price declines!

To sum up the above:

- If the spot and implied volatility remain constant, a decrease in premium of an existing USD call and an increase in the premium of a USD put can be caused by:

    - A reduction in the USD interest rate or
    - An increase in the interest rate of the second currency.

As we discussed in Chapter 2 in the example of Apple forward – as the financing (second currency) currency's rate goes up, so does the forward, hence the strike of an existing call will end up more in the money. The same happens if the yield from the asset (interest on the currency) falls.

- If the spot and implied volatility remain constant, an increase in premium of a USD call and a decrease in the premium of a USD put can be caused by:

    - A reduction increase in the USD interest rate or
    - A reduction in the interest rate of the second (domestic) currency.

- A higher USD interest rate keeps the interest rate component of time decay of deep ITM USD call relatively high comparing to that of an OTM put with the same strike, because they assume that the underlying hedge will provide a positive stream of income. Investors managing unhedged positions often overlook this point, as they don't consider hedging costs.

Equity Options Specifics

The same conclusions apply to options on equities and other assets. The main difference is that the foreign currency interest rate is transformed into a rate of yield on the underlying asset. In the case of single stocks it is dividend yield.

In the past, dividends paid by companies in developed markets were predictable. That changed after 2007–2009. Dividends have never been predictable in emerging markets, where unexpected special dividends, variable payment dates, and varying amounts have been typical. Dividend payments of ETFs are also difficult to predict. Hence, overall stock option pricing became more challenging.

Assume you expect to receive a 10% dividend from Lukoil (large Russian oil company) in six months and ask for quotes on three-month and nine-month options. How will the anticipated dividend influence option prices? It shouldn't affect the three-month option, it will affect the nine-month option if the precise dividend rate is unclear.

First it's important to realize why dividends require adjusting option prices. When a stock trades ex-dividend, call premiums should decline because the underlying is less likely to reach a higher strike price. Conversely, put premiums will increase ("Dividends are in the put prices"). This adjustment also changes options' delta.

Let's assume a 5% special dividend will be paid in three-months and you are pricing a three month option. A 5% dividend inserted into a three–month model will roughly calculate yield based on 5% x 90 / 360, which is not correct for a three month option, and better suits a one year option pricing. There's another approach. Quadruple the expected dividend to determine its annualized rate based upon the three-month rate thusly: 5% x 360 / 90. Option pricing models assume daily compounding, but dividends actually arrive at a specific point in an option's life. To convert a 5% non-recurring dividend paid within three-months, use its annual equivalent, 20% in this example.

Since the exact date and amount of the dividend payment are unclear, we can go another way and use 5% as an approximate annual dividend rate. If payment arrives within three months, three-month puts are undervalued, because their prices are calculated using the 5% rate, not the 20% above.[60]

The third approach is to adjust the implied volatility. Because put / call parity holds options with identical strikes can't have different implied volatilities. To derive the dividend rate, find the rate that restores the options' implied volatility to parity. Most vendors provide this functionality.

American-style Options

American-style options can be exercised before expiration. Although investors value this feature, it's seldom valuable in practice. Consider the economics of early exercise based upon our USD / JPY example, this time using a one-year 95.00 USD American-style *put*. At purchase, the forward differential was 5 yen (−500 pips) and the spot traded at 100.00. Assume that immediately after the purchase the spot price declined and the put went 5 yen into the money as the delta increased from 50 to 70. Should you exercise the put?

The answer is "No." A one-year, 70-delta option has considerable time value. By exercising you receive only the intrinsic value while losing all the time value. Whenever the remaining time value is significant, it's not advisable to exercise the option. If you want to take your profit, sell the option rather than exercise it. The market maker will pay for the time value because he hopes to make money on rehedging the option.

Suppose the option's delta reaches 100%. Its time value is near 0. How about exercising now? In this case, the answer requires calculating the income and costs of hedging. If your hedge is long a high-yielder like the USD, as in this case, and short the low-yielder (the yen), your dollars on deposit earn more than you pay for borrowing yen. You enjoy a carry profit over the time remaining until option expiration. During that time, the option position remains hedged with the spot position.

Therefore it seems there's no situation when it's profitable to exercise an American-style *call* option on the high-yielding asset or currency while the *forward differential is negative*, because you forsake the profit from financing.

Performing the same analysis for a one-year 95.00 USD call, assume this time the spot gapped up to 105.00 immediately after you bought the option and is now 5 yen in the money as its delta increased from 50 to 70. Should you exercise the call? Again, the answer is "No" and for the same reason: a considerable portion of the option premium is time value that will be lost if exercised early.

What happens if it's a 100-delta option? This time you'll sell dollars to hedge the intrinsic value, which means you'll incur a high forward interest rate differential. Since this alternative is unattractive, you're better off exercising the option.

To sum up, only *call* options on *currencies (assets) with higher interest rates* should be exercised before expiration. It's not reasonable to exercise puts on these currencies (assets), *if you can hedge them with the underlying*. This distinction between the behavior of hedges of calls and puts is programmed into option models. They "know" which has the potential for extra gain from early exercise, and the price of the American-style put in our example won't differ from the European-style put. However, prices of American-style calls will be more expensive than their European-style counterparts.

Let's consider a more complex example. Suppose you own a one-year 92-delta American-style *put*. Should you exercise it? Once again, answering requires thought. Its premium probably includes some time value. If it's more than the implied forward differential, it's better to sell the option. If its time value is less than the differential, the market-maker will pay less to buy the option, since market-makers dislike hedging American options with high deltas. If you can't sell the option at a reasonable price, it's sensible to exercise it, provided the forward differential exceeds its time value.

The easiest way to determine the time value of an American-style option is to compare it with a European-style option. For example, to find the time value of an ITM 120 put (95 delta), look up the price of the 120 call, as the time value of an ITM American put is almost[61] equal to the time value of an OTM European call with the same expiration and strike. Market-makers dislike buying ITM American-style options with large deltas, which can exceed 100%. With the option gamma being low, market-makers may lose money funding the hedge, reducing their chance to make money on the hedge.

In addition, an OTC market–makers might show you a “bad” bid when you try to sell an option back to him. You must incorporate this extra “slippage” into your future transaction costs or else stop dealing with that market-maker. Before closing such positions, check several points. First, if the underlying isn’t sufficiently liquid in the size needed to hedge your options position, market-makers will charge an illiquidity increment. You might be able to reduce their increment by asking them to bid on implied volatility. Then verify what REPO or forward rate they’re using and exchange the hedge when trading the option. To exchange the hedge, buy / sell the hedged amount in the market and sell it with the hedge.

Second, note the shape of the forward (REPO) curve. It influences how market-makers will hedge themselves after buying your option. Often, the forward hedge is more expensive or harder to obtain you’d given your experience in the spot / cash market. For example, you might have to pay 13% annually for a REPO on local Gazprom shares. As a result, the strike of a one-year ATM option at the current forward price will be 6.5% lower (13% x 50-delta) than the current spot price. Alternately, the premium for an ATM Euro style call with the strike at the current spot price will be around 6.5% more expensive than that of an ATM put.

Trading American-Style Options

Earlier we concluded that American-style puts behave like and have costs similar to their European-style peers. That’s why they’re sometimes called “fake American” options. However, fakes can turn real, and American-style options become more expensive than the European. That occurs when the forward differential signs invert or the interest rate relationship reverses.

For example, euro interest rates exceed dollar rates for a while, but then that relationship reverses. Suppose a one-month Microsoft 31.36 American-style call costs 1.89% with a financing rate of 0.25%, dividend rate of 18.63%, and implied volatility of 18.35. The European-style call costs 1.76%. Both American and European-style puts are around 2.48%. The American puts are “fakes” because they should behave like the European-style option. If the dividend rate declines below the financing rate, the “fake” puts will behave like “real” American options, and their premiums become more expensive than the European options. This situation may occur in 2014 for low-dividend stocks if the interest rates start increasing

A second interesting opportunity is presented by market–makers' dislike for hedged "true" American style options. Often you can buy a hedged high-delta American option a bit cheaper in implied volatility terms than an OTM option. Applying the put / call parity turns a notional (rather than delta) hedged ITM option into the position resembling a low delta option in the reverse direction.

It's best to do trades like this when you expect a trend to develop in the direction of the strike and believe that funding costs will be smaller than assumed at the time you put on the position. You also could do this trade when you believe the dividend forecast embedded in the difference between the implied volatility of the calls and the puts for a stock.

PART 4

APPLYING DIRECTIONAL TRADING PRINCIPLES TO MARKET STRATEGIES

CHAPTER 14
GENERAL CONSIDERATIONS IN OPTIONS STRATEGIES

Your trading results are improved by using a systematic approach that includes defined principles, objectives, stop-loss limits, position size, and holding periods. Yet knowing these principles isn't enough. You must internalize this knowledge in judgments that conform to your personality and comfort.

Thought Processes Behind Options Trading or Any Kind of Investing or Trading

Most of us think in linear cause and effect relationships, but options trading often requires analytical patterns resembling those of Eastern cultures. The difference is that the European style of thinking (based on Socratic logic) optimizes a given scenario, in other words a single "picture of the world." The Eastern approach, by contrast, summons up many such pictures and chooses the most suitable. In essence they are much better suited for the VAR age, because, as you know, VAR (Value-At-Risk) mixes up every possible scenario of interaction among market parameters and calculates maximum loss of your position based on the worst combination. That is, it creates a picture of the world that an investor would not consider likely, rather than a scenario he prefers and upon which he calculates the least favorable outcome.

One such pattern is the iterative style of logic applied to the Talmud, as the following adoption of a two thousand year old anecdote makes clear.

A young man knocks on the door of a noted rabbi, announcing, "I wish to study Talmud."

"Have you studied Torah?" asks the rabbi.

"No, but I graduated summa cum laude in philosophy and wrote my doctoral dissertation at Harvard on Socratic logic."

"I doubt you're ready to study Talmud," the rabbi says, "but I will examine you in logic, and if you pass I will teach you."

The young man agrees, and the rabbi begins.

"Two men come down a chimney. One emerges with a clean face; the other with a dirty face. Which man washes his face?"

"The man with the dirty face," the young scholar answers.

"Wrong. The man with the dirty face sees the man with the clean face and thinks his face is also clean. The man with the clean face sees the man with the dirty face and thinks his face is also dirty. So the man with the clean face washes."

"Clever," the would-be scholar says. "Give me another test."

The rabbi repeats: "Two men slide down a chimney. One emerges with a clean face; the other with a dirty face. Which one washes his face?"

"We have established that the man with the clean face washes."

"Wrong," answers the rabbi. "Both wash. The man with the dirty face sees the other man and thinks his face is clean. The man with the clean face sees the man with the dirty face and thinks his face is dirty. So the man with the clean face washes. When the man with the dirty face sees him washing, he also washes."

"I'm shocked to be making such errors in logic," says the young man. "Test me again."

The rabbi again says, "Two men come down a chimney. One emerges with a clean face and the other a dirty face. Which one washes his face?"

"Both."

"Neither. The man with the dirty face sees the man with the clean face and thinks his own face is clean. The man with the clean face sees the man with the dirty face and thinks his face is dirty. But when the man with the clean face sees that the man with the dirty face doesn't wash, he doesn't either. So neither washes his face."

The young man is desperate. "Please, give me man more test."

The rabbi groans. "Two men come down a chimney. One man comes out with a clean face; the other with a dirty face. Which man washes his face?"

"Neither."

"Wrong. Do you see why Socratic logic is useless for studying Talmud? How can two men come down the same chimney, one with a clean face and the other with a dirty face? The whole question is *narishkeit*—foolishness—and if you spend your life trying to answer foolish questions, all your answers will be foolish, too."[62]

That story illustrates a few points mentioned earlier. First, each strategy can be viewed from many viewpoints. To some it may look irrational, but it fits your style. Or it may not fit your style, but it fits a specific situation. What hurts most is *narishkeit*—foolishness—when you do something in haste that fits neither your style nor the situation. Second, always prepare for unexpected turns in market logic generally. Each situation can develop into something unexpected, and only in hindsight do you realize you overlooked or underestimated another scenario.

Most people go through stages in developing option positioning skills. Initially they focus on behavior of the underlying asset's price. Then they realize that a crucial component of options investing is determining how long they must hold a position before their market view materializes. Finally, they understand the importance of implied volatility. At some point, investors realize something they learned at the beginning: they can sell or exercise options (of any style) before they expire. That's why in the interim the volatility and holding period forecast are flexible targets. Using the analogy of the story, we can say that with experience we discover new perspectives on previously obvious situations. The following framework will help to accelerate the process of discovering these perspectives when working with options positions hedged in ways other than those assumed in delta-neutral hedging.

Determining Investment Horizon and Sizing Positions

Determining Investment Horizon

To succeed at trading options you must apply your preferences consistently. For instance, some investors sell options to maximize the premium they receive, whereas others emphasize minimizing risk. Therefore, investors who prefer high premiums select options with deltas above 25%, whereas risk-minimizing investors prefer deltas of 20–25%. If you're consistent you'll be fine, even if your ideas are strange to others. Follow your own techniques. Other people's strategies may fit their views, but they'll have trouble protecting them if circumstances turn against them. For instance, time decay erodes investments in lower-delta options quickly.

Let's review some conservative principles for determining the length of option positions.

- For long positions, the time to expiration should be double the period during which you expect the underlying's dynamics to be realized. If you expect your market move next month, buy an option or spread expiring in two months.

Buying options with expirations longer than your market expectations means you'll pay more and, in the context of limited capital, you'll take smaller positions (i.e., less leverage), but recall Chapter 4, which advised against focusing on the size of your investment when dealing in longer-dated options. Despite the potential time value, the theta of options with a long-term expiration is minimal, since the value lost through time decay is less than for shorter-dated options with the same notional and delta. These conservative suggestions force us to remember we aren't fortune-tellers and that our estimates are just guesses. Besides, the briefer the forecast period, the more likely we'll be right. Lots can happen between the time you develop a long-term forecast and the end of your time horizon.

- For short positions, the time to expiration should be half the forecast period. If you expect actual volatility to be lower than implied volatility for two weeks, sell a one-week option.

Both bits of advice above are partial cures for what we learned in Chapter 6: we overestimate conjunctive probabilities, especially when forecasting both direction and timing. We anticipate simultaneously the worst and best scenarios—i.e., extremes of the move—and that's merely when we're thinking about the underlying. Add in options-related issues, and we're constantly running complex forecasts. There's little probability that any one thing will occur as predicted, and joint probabilities are unbelievably low. Conservative structuring helps us to get out of our own way.

Sizing Positions

- Whatever time horizon you've forecast, restrict position sizes to no more than half of a regular position.

If you're comfortable investing \$80 in a strategy, limit your option position to \$40. By doing so you have staying power if the market goes against you, and you'll be comfortable adding to the position if you still believe in it. Seeing no immediate danger, we overestimate our tolerance for when the market sours. Risk management should include practices that keep you calm during bad times. Half-sizing your initial positions does that.

Essential Components for Taking a Long Directional Position

In taking a directional position you must forecast the price movement direction of the underlying, when it will occur and the volatility.

The Underlying Price Forecast

- Develop an informed view about the likely direction the underlying asset price will move.
- Estimate the maximum (minimum) price change.

Time Forecast

- When will the forecast movement occur?
- How long should the price remain at a defined level, or how long will a trend last?

Volatility Forecast

Address questions like those following.

- Relative to the past two weeks or months, depending upon the period of your proposed position, is current implied volatility high, low, or in the middle of its recent range?
- How stable is the relationship between the realized or historical volatility and the implied volatility?
- What factors might influence current implied volatility?
- Did the relationship between the realized or historical volatility and the implied volatility change because the market outlook changed or was it because liquidity changed? Be cautious if something affected liquidity; a single investor can affect options liquidity, making it a factor difficult to assess.
- What should implied volatility do if the forecasted price change occurs?

If implied volatility is high and expected to fall during your holding period, favor strategies (such as vertical spreads) that balance short and long options, rather than outright puts and calls. *In other words, try to capture the right direction without excess exposure to volatility.* Ratio spreads reduce investment in the position and extend the middle strike, expanding the profit-making range. However, ratio spreads require you to predict the limits of an underlying asset's moves. We've seen that's improbable for short-term positions, and even harder over the longer term with greater probability for price movement. If implied volatility is low and expected to rise during your proposed holding period, consider strategies that feature more long options than short, such as ratio spreads. *In other words, try to benefit from volatility increases.*

Essentials of Short Directional Positions

The Underlying Price Forecast

- Develop an informed view of the likely direction the underlying asset price should not move.
- Estimate the maximum (minimum) price change.
- The worst maximum price change (the catastrophic scenario).

Time Forecast

- Decide how long you will wait out an unfavorable price move.

Volatility Forecast

Answer the following questions to structure your position.

- Relative to the past two weeks or months, depending on your anticipated holding period, is the current implied volatility high, low or range-bound? Will anything likely influence current implied volatility?

- What should happen to implied volatility if the direction of the underlying asset reverses?

If implied volatility is high and you expect it to fall during your holding period, consider outright short puts or calls and strategies that feature more short than long options (e.g., ratio spreads). A credit received when selling ratio spreads secures some protection if your directional forecast turns out slightly wrong, because you may invest the credit in buying a covering strike. If you're right, you'll gain on short vega, if volatilities collapse. That is, you collect some premium (albeit less than with short options outright) and then close the position at additional profit if it trades in the direction of your long option, while your short options lose both from time decay and implied volatility.

If implied volatility is low, spread strategies are less advisable. You're better off buying calls or puts outright.

Two Principles For Success with Directional Positions

Selling strategies are more attractive but riskier than buying strategies, so remember these key principles.

First Principle: Dealers in the cash/spot market make money if price of the underlying asset moves in the favorable direction. That's also true when you buy options. In fact, long options are more demanding, since buyers must be right about direction, timing, and changes in volatility. Short options are profitable when your directional forecast is correct or *the underlying asset doesn't go against the option position*. Option sellers hope the premium they collect will exceed the loss if it's exercised. They achieve that goal when the underlying asset moves against the sold option and when its price doesn't exceed the seller's strike price. The subtle difference is important: it is more difficult to be right on timing and direction than being not wrong.

Second Principle: Don't sell cheap options no matter how confident you are in your forecast. Large short positions of cheap options have potential for big losses. You may make money initially, but inevitably you‘ll open a losing position, and your losses will dwarf your previous profits. If the option is exercised, the tiny premium you earned will turn you into an owner of sizable positions you never intended to have.

A cheap OTM option is one with a premium below the historic premium for similar delta, or it's an option with a small absolute premium—for example, under 5 pips. Suppose you sell three-week 10-delta options in small position sizes or as part of a hedge. Although they're unlikely go ITM, sharp moves by the underlying in the wrong direction or sudden increases in implied volatility could be devastating.

Our previous advice to buy back cheap options is related to this principle. Consider previously sold short-dated options as new potential shorts. If you would not short these options, do not leave them in your portfolio.

Select Simple Strategies when Buying to Establish Position

All told, you still must choose the best strike to buy (or sell). Your choice depends on the strength of your market view (discussed in later chapters) and intended holding period, but after considering these factors many investors run out of ideas for comparing the efficiency of strikes. They may call market-makers and receive the answers summarized in Table 14.1.

Table 14.1
Implied Volatility Premiums for Risk Reversals on Gold

Delta	Puts		ATM	Calls	
	10	25	50	25	10
1M	24.25	22.23	21.7	22.98	25.75
2M	23.55	22.27	22.5	25.52	28.05
3M	23.2	22.43	23.3	26.17	30.7
6M	23.1	22.65	24	27.55	32.9
1Y	23.5	23	24.5	28.4	34.3

To derive the volatility price of an OTM call or put, look at the volatility of the ATM option on the same line of the table. For instance, a one-month 25-delta call is offered at 22.98.[63] Prices of risk reversals are derived from Table 14.1 as shown in Table 14.2. As you see, a one-month 10-delta risk reversal equals 1.5 and is calculated as the difference between 25.75 and 24.25.

Table 14.2
Summary Premiums for Risk Reversals for Gold

Expiry	25 Delta	10 Delta
1M	0.75	1.5
2M	2.25	4.5
3M	3.75	7.5
6M	4.9	9.8
1Y	5.4	10.8

Once a non-specialized option user sees these strange numbers, he doubts which options to choose. Suppose he has $1 million in capital and expects gold to reach 1700. He remembers that maximum leverage comes from buying OTM options with low deltas and at small prices, because he could acquire a larger nominal position. Suppose $1 million could buy enough 1650 calls on 100 ounces of gold or more 1675 calls on 200 ounces.

To figure which is preferable, calculate the result with the 1650 calls with a notional size of 100 ounces to be equal to the financial result of the 1675 calls with a notional size of 200 ounces. In other words, to choose between the strikes, run the familiar calculation. The gain will be greater from 1650 to 1700. In addition, if gold falls, the 1650 calls retain some value, while the 1675 calls will lose more because options with deltas under 25% lose time value faster than options with deltas above 25%. Options with closer strikes have less risk. Ceteris paribus, this calculation finalizes his strategy.

Misconceptions about Skew

Skew is important in developing a specific strategy and choosing entry and exit timing not only from traders and investors, but from the financial press and technical analysts, who often regard skew as an indicator of changes in investor sentiment. Some even assume it reflects views about market direction. In truth, skew is more a function of liquidity than fear, a principle your author found true in every market he traded. Market-makers who spent time in relatively liquid markets often can't imagine how steep the premium can be.

In a simple world, if the market expects a correction, demand increases premiums of options in that direction, thus changing skew. However, often skew increases for the opposite reason. As major players become confident about the trend, they may increase their positions in the underlying and buy puts to hedge. In other words, bearish *and* bullish views about the underlying increase bids for puts. Skew can be a function of market liquidity in other ways. If a large client buys a particular strike in size, supply and demand elevates its implied volatility despite an unchanged consensus forecast. Besides, he might be taking profit on an old position rather than opening a new one.

Some commentators believe skew forecasts the dynamics of implied volatility once an underlying reaches a particular price. For instance, they note that volatility on a one-month ATM option trades at 12% while the strike 3% out-of-the-money trades at 14%. They reason that ATM volatility will rise from 12% to 14% if the market falls 3%. Unfortunately, markets seldom work this way. If the market does drop, volatilities may increase only to 13%. Had the market incorrectly predicted future implied volatility? No. Does it mean the options market correctly predicted the direction of a move? No again. The skew reflects a higher risk premium for downside protection but without forecasting a direction of the underlying. In sum, commentators insist that skew mirrors a market vision, but their insistence is useless without knowing investment flows in the underlying and its options.

CHAPTER 15
MARKET BEHAVIOR SCENARIOS AND INVESTMENT ALTERNATIVES

This chapter summarizes earlier material encapsulating the principles, strategies, and actions that apply when executing market views. I wrote an earlier version of this material to train my salespeople to recognize strategies that serve client's market views. This recap is necessary before moving to the next chapter, which discusses options strategies using technical analysis.

Basic Option Positions: Case Study

We begin with a chart of Russian Eurobond prices as a reference.

Figure 15.1
Chart of Eurobond Russia 2030

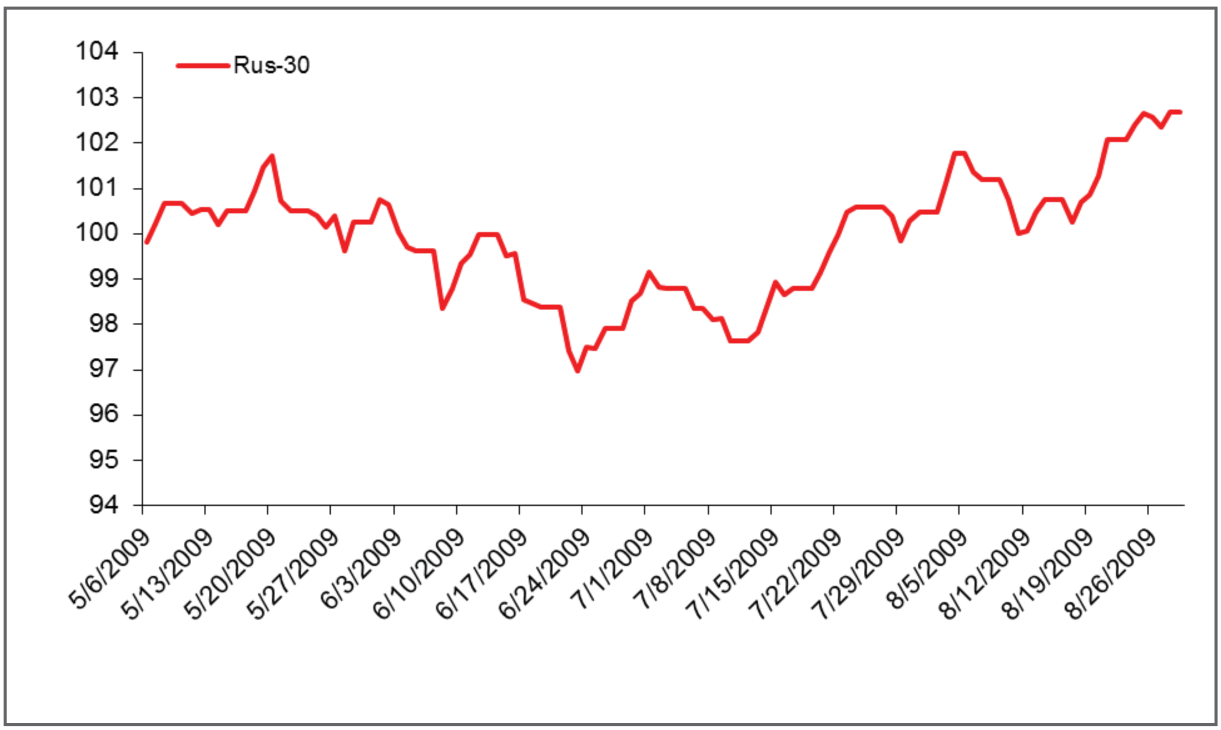


Figure 15.1 shows that the price of the Russian Eurobond maturing in 2030 (Rus-30) increased to more than 102 (102% of par[64]). You believe its price has peaked, and you're contemplating four scenarios:

Scenario 1: Its price remains constant for some time.
Scenario 2: Its price declines and then stabilizes at a lower level.
Scenario 3: Its price declines and will fall further if it breaks support at 100.
Scenario 4: Its price declines sharply.

Remember how you felt the last time you were analyzing a market that seemed stuck at the top of a range. Remember your psychological discomfort and perceived risk as you analyze the alternatives below.

Scenario 1: Consider selling a strangle. The stronger your conviction that the range will remain stable, the closer you should position the strikes of both the put and the call to the current underlying price, selling options with the highest premiums.

Scenario 2: Sell a call or a vertical call-spread, or buy a put ratio spread 102/101, 1:2 (buy $1 million 102 puts and sell $2 million 101 puts). The total premium paid should be near zero. If you forecast correctly, the price will ease slightly. Around expiration exercise the 102 puts as the 101 puts expire worthless.

Scenario 3: You aren't expecting a breakdown, so you want to avoid the risk of selling ratio put spreads. If you sell a 101/103 strangle and buy a 100 put, you end up with a premium-free albatross.

Scenario 4: If you think the price will fall sharply, buy a put on the Eurobonds or a put spread, or perhaps sell the bond itself.

Using Options to Supplement Underlying Asset Positions

Let's alter assumptions. This time you're long $3 million Eurobonds at 101 and seeking an options strategy that provides additional income or downside protection.

Scenario 5: You think the bond's price will rise at a moderate rate. Consider selling a covered call. Stay long the Eurobonds and sell one-week 104 calls with a face value equal to your Eurobond position for 30 basis points. If the bond advances in price, your short calls will be exercised at 9104, but if the bond remains under 104, the calls will expire and you'll keep the 30 basis points.

Scenario 6: You expect the price to fluctuate between 103.5 and 101.50. You're equally willing to increase your position at 101.50 or close it at 103.5. This is an ideal situation for selling a one-week 101.50/103.50 strangle, selling the 101.50 put and the 103.50 call for 70 basis points. If both expire out of the money, you'll pocket both premiums. In practice, some investors don't understand this strategy right away. To clarify, by selling the 101.50 put you agree to buy more bonds at 101.50.

Scenario 7: You think the price has nearly peaked. You're prepared to sell your position at 103.50, but you're also concerned about a sharp pull back. Consider a collar (range forward) by selling 103.50 calls and buying 100.75 puts with proceeds from the sale. If the price continues higher, you'll sell the Eurobonds at 103.50. However, because you're long the puts, you've protected your downside below 100.75.

Scenario 8: You're sure the bonds eventually will rise and are ready to double your position size if the price retraces to 100.

The first consideration is that selling the 100 put may keep you from buying more bonds if the market comes to your level. If the put expires unexercised, however, you may miss a buying opportunity. If you don't want to chance that, simply buy the bond.

Second, you may be concerned that the market will drop farther, notwithstanding your convictions. If so, *buy*, for instance, $3 million one-week 100 puts. If the price drops to 100, buy the additional $3 million of the bond; the puts will provide cheap insurance or act as a stop-loss. Meanwhile, your expected maximum loss will increase only by the amount of the premium you paid.

Note the difference between Scenarios 6 and 8. Scenario 6 is preferable when your market view is neutral and you're trying to increase income. Scenario 8 is preferable when your view is locally bearish and you still want to increase your position.

Scenario 9: You think the price will increase tomorrow. Buy low-delta, OTM, one-week calls. The premiums are small, but they'll rise sharply if your forecast is right.

Legging into Positions

Remember an important maneuver that we discussed earlier: legging into a strategy.

Let's revisit Scenario 6, in which you expected the price to fluctuate between 101.50 and 103.50. You want to increase your position at 101.50 or reduce it at 103.50 by selling a 101.50/103.50 strangle in one transaction. Remember: premiums are highest when the bond's price reaches the extremes, either 101.50 or 103.50. However, at these levels you could sell the put when the bond trades around 101.50

and then sell a call when it reaches 103.50. Successfully implementing this strategy maximizes your premium income. The dilemma is to get a higher premium by legging into a position or accept a lower premium by selling a 101.25/103.75 strangle in one transaction. Legging has less probability of success, so the dilemma is real.

The dilemma becomes more noticeable when creating butterflies. Chapter 8 presented several calculations for ratio spreads. Let's review them. You bought one Goldman Sachs 120 call and sold four 126 calls, creating a 120/126, 1:4 call spread. What's the break-even for the strategy? How much are you short?

1. Calculating the net-short synthetic position gives us 4 − 1 = 3. Therefore, the strategy consists of three calls of the following sizes: 1:4:3. You would lose no more than your debit on this position.

2. Let's calculate maximum profit on the long close strike. It would be (126–120): 1 = 6. The maximum profit is 6 points if the stock is 126 at expiration.

3. Now calculate how fast the net-short position will kill this profit: 6:3 = 2.

4. Now calculate the break-even, adding 2 to the short middle strike: 126 + 2 = 128.

Thus, above 128 your call ratio-spread loses money. To prevent a loss, buy three 128 calls on the underlying shares. Doing so transforms your position into 120/126/128, + 1/−4/+3. The position has no risk if you pay no premium, but that's unlikely without legging in.

When you leg in, you accept intermediate risks, as you'll need to guess two or three entry points. In addition, you need to pay dealers' bid / ask spreads for all three, although market-makers likely will narrower their spreads for each option if you make all three deals at once. Prices in implied volatility terms likely will be worse when making three deals separately.

Skew can also increase the price of buying the covering strike (especially in the direction opposite the general move of the underlying), since prices for lower-delta options are higher.

Another point: what if you don't buy the three 128 calls? You want the strategy to be profitable within the 120–126 range. You can't achieve that strategy premium-free by executing the 120/126 ratio spread in one transaction, without taking the risk of not buying the far-away covering strike.

In conclusion, let's review earlier observations about minimizing total cost of an option position.

- The greater the *difference* between the notional values of the long close and short middle options, the further strikes are from each other. In our example, 1:4 gives a \$6 difference between the near and middle strikes. If the difference between the face values were 1:7, the difference between these strikes would be greater.

- Meanwhile, the greater the difference between notional sizes, the closer the middle and covering strikes will be. In our example, it's \$2–i.e., (128 − 126). If the proportion of notional sizes were 1:7, the distance would be smaller—for instance, \$1.

CHAPTER 16

BASING OPTIONS STRATEGIES ON CORRELATIONS OF UNDERLYING ASSETS

Using historical examples from the gold market, this chapter warns about a key mistake: trading one market based on information from another market. Errors inherent in that undertaking prevail throughout investing, but when trading options the errors increase due to the differences in the underlying assets.

Cross-market Views

Investors sometimes trade assets in one market based on views of another market—for example, selling emerging market bonds based on changes in the S&P 500 Index or trading currencies based on forecasts of interest rates in other countries. Trading on forecasts about other markets is treacherous and a tough way to make money, especially when trading options. If, for instance, FX investors are convinced of their S&P 500 forecasts, they should trade the SPX or SPY rather than try to implement their S&P-driven strategy in FX markets. FX markets are influenced by many factors besides movements in the S&P. Managing risk in FX markets is difficult enough, let alone using other markets as the basis for a trade.

Perhaps you are convinced you'll prosper in a market you don't fully know. This type of overconfidence is well described by the old joke about Uncle David, whose niece asked her grandmother what uncle David did for a living.

"He's an economist" grandma answered.

"Like Karl Marx?" the girl asked.

"No, Marx was just an economist. Uncle David is a Chief Economist!"

Investors always consider information from other markets when making an investment, but remember that *the simpler your investment thesis, the easier you can manage your positions*. Following is a case in point from the gold market in 2006.

Historical Correlations in the Gold Market

Summary of Gold Market Mechanics

First let's understand several factors specific to the gold market. Market-makers in gold forwards, as in other markets, prefer market-neutral positions or positions that depend minimally on movements of spot gold prices. Therefore, when market-makers purchase forward contracts from clients (i.e., buy gold), they sell gold at spot to hedge spot price fluctuations. Since selling spot gold may require physical delivery market-makers without physical gold to deliver borrow it by obtaining a gold loan (similar to a REPO on stocks or bonds). Then they sell the borrowed gold in the spot market.

These mechanics explain something significant: when gold producers reduced their hedging—that is, cut back on selling their production in the forward market—market-makers also stop selling gold in the spot market. Consequently, gold's spot price begins to rise. As borrowings of physical gold declined, lease rates (the price of borrowing gold) remained low across the forward price curve. Like any market suffering excess liquidity, bid-offer spreads between short-term and long-term contracts narrow.[65]

Market Situation in 2006

By 2006, gold had become expensive for several reasons. Around 2002, prices for food and real estate rose, making gold a popular inflation hedge. As noted, gold mining companies had begun to trim their forward production hedges. Concurrently, to satisfy increased demand, gold ETFs were introduced. Investors who previously couldn't invest in physical metals enjoyed liquidity and low transaction costs on major exchanges through gold ETFs.

To diversify their reserves, central banks began increasing their physical gold holdings. Then to earn fee income on their greater gold reserves, they leased gold to commercial banks, which lent it to hedge funds, which used it for trading. Thus, central banks became primary suppliers of physical gold to the market. That's why by 2006 lease rates had declined across the entire lease rate curve from one month to one year. Table 16.1 shows the spot price of gold was $625.00, the three-month forward rate was $633.45, and the one-year rate was $659.66. Thus, gold's popularity and price had increased, but the forward curve fell and flattened.

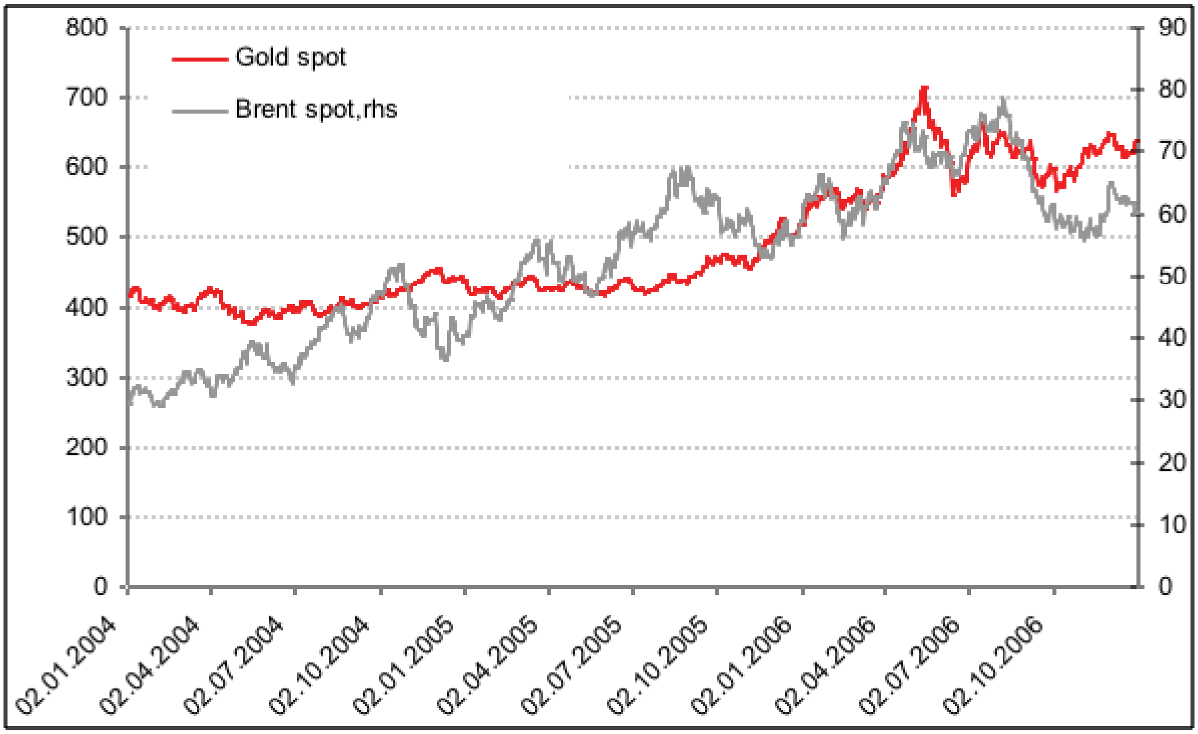
Table 16.1
Gold Lease Rate Curve - Summer 2006

Maturities	Gold Leasing Rates	Gold Price	Contango	USD Rates
O/N				5.24%
T/N		$625.00		5.26%
1W				5.28%
2W				5.28%
1M	5.34%	$627.78	$2.78	5.29%
2M	5.38%	$630.60	$5.60	5.33%
3M	5.41%	$633.45	$8.45	5.37%
6M	5.47%	$642.09	$16.09	5.45%
9M	5.47%	$650.64	$25.64	5.47%
1Y	5.47%	$659.66	$34.66	5.47%

Gold as an Investment

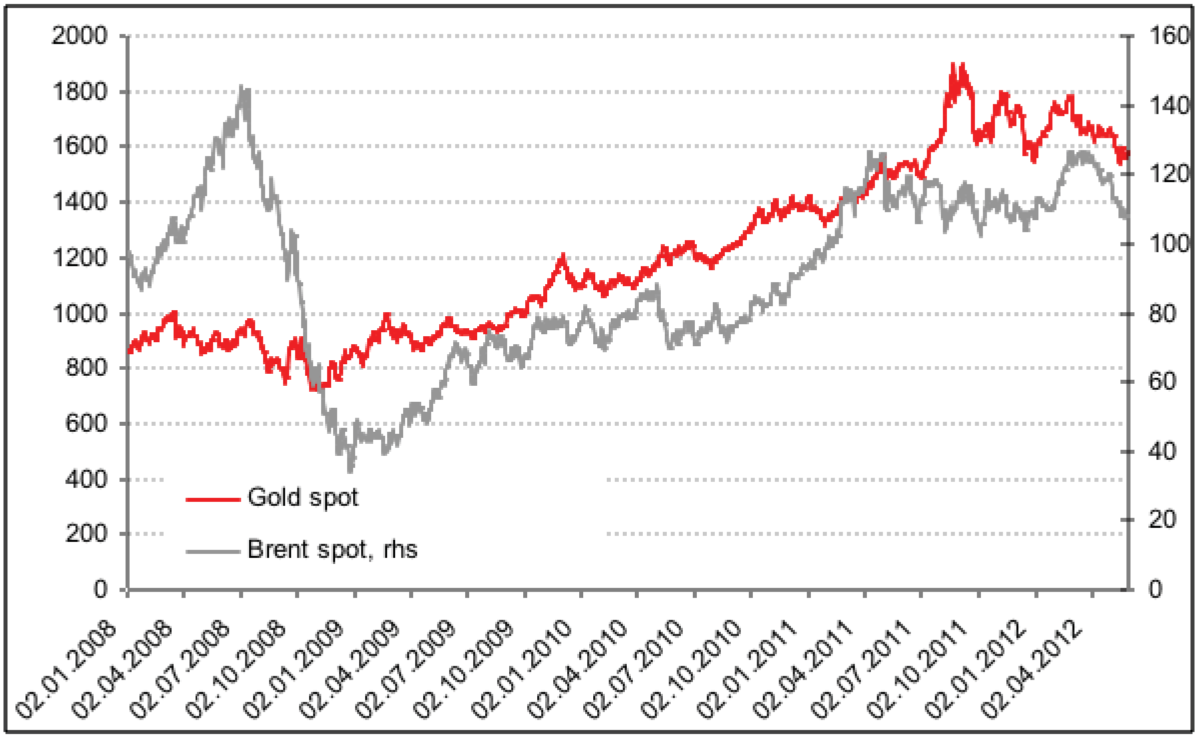
Gold prices embody many more considerations than most assets. Besides being affected by supply and demand or production costs, the price of gold is an emotional barometer of almost anything that worries the world. In 2006, that worry was oil prices. Under the principle of trading the market you know, investors who believed oil prices would continue rising should have invested in crude oil. However, conventional wisdom in those days insisted "Gold will rise because it's highly correlated to oil." Convinced by conventional wisdom, by 2006 many investors were trading gold based on their views about oil (Figure 16.1).

Figure 16.1
Relationship between Oil (Brent) and Gold Prices 2004–2006



That's when the fallacy of trading gold as a proxy for oil became apparent. As Figure 16.2 indicates, correlations between assets do not hold indefinitely. In one year, gold might be driven by oil, as in 2006. In another, it may be driven by the stock market, as in 2008–2009. In 2011–2012, gold prices tracked decisions by the ECB. Unfortunately, today's correlation seems almost internal in the midst of a trend, and investors refuse to believe it can change.

Figure 16.2
Relationship between Oil (Brent) and Gold Prices 2008–2012



2006 Options Positioning

Why buy gold instead of oil? One reason is a smaller premium for the same leverage in gold options vs. oil options. If the implied volatility of gold is lower than oil or the gold implied volatility skew could also be less pronounced for gold than for oil. For example, in 2006 the risk reversal price for gold was as follows:[66]

Table 16.2
Gold's Risk Reversal Premiums

Risk Reversal	25 d	10 d
1M	0.75	1.5
2M	2.25	4.5
3M	3.75	7.5
6M	4.9	9.8
1Y	5.4	10.8

When buying a one-month call and selling a 40-delta risk reversal, you pay a premium of 0.5% in implied volatility. Every tick in volatility weighs heavily upon the price of one-year 25-delta options. Hence, this substitution of oil options for gold options would be justified if the *difference* between the skews of option prices of oil and gold were substantial.

This chapter demonstrates that you should adopt options positions only on the underlying assets incorporated in your market view. In this case, you should have bought a long-term gold call instead of an oil call. You'd have been better off in 2008–2012, when oil didn't rise much but gold did.

Still, why oil and gold but not other correlating commodities? That question remains unanswered. If you compare Figures 16.1 and 16.2 with Figures 16.3 and 16.4, you'll see that gold and copper also appear to have been highly correlated.

Figure 16.3
Relationship between Copper (LME) and Gold Prices 2004–2006

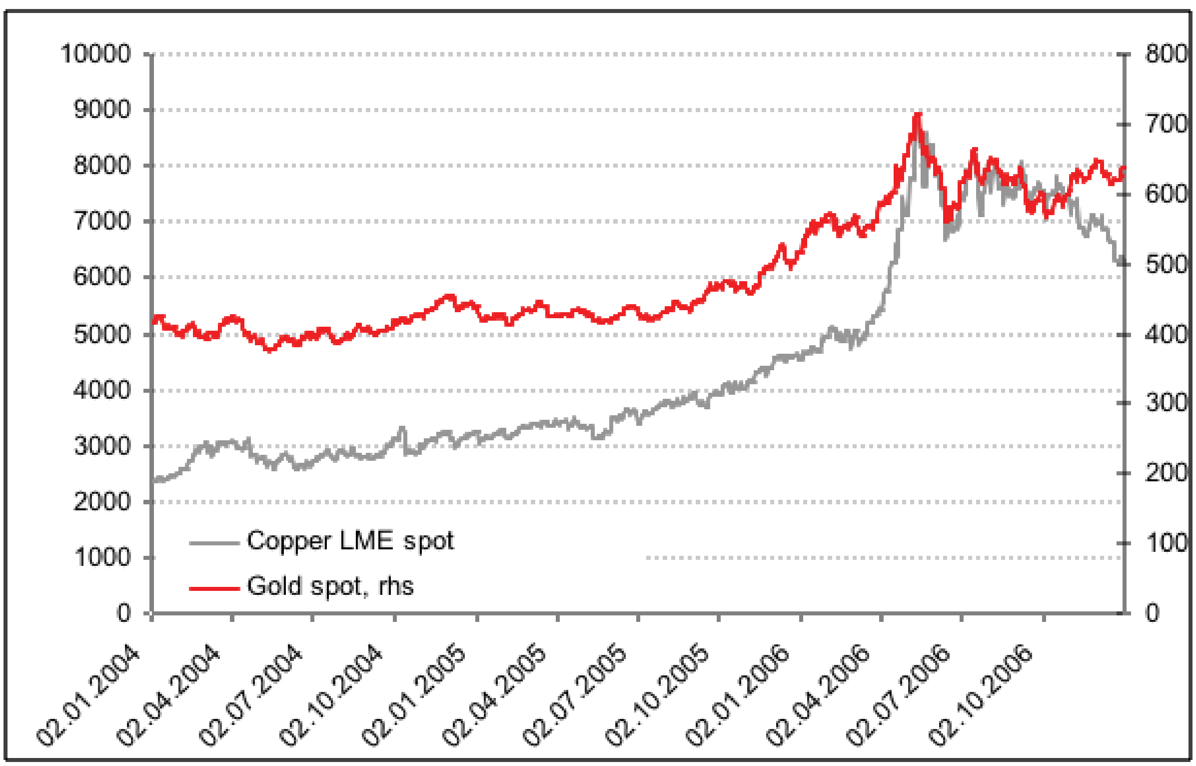
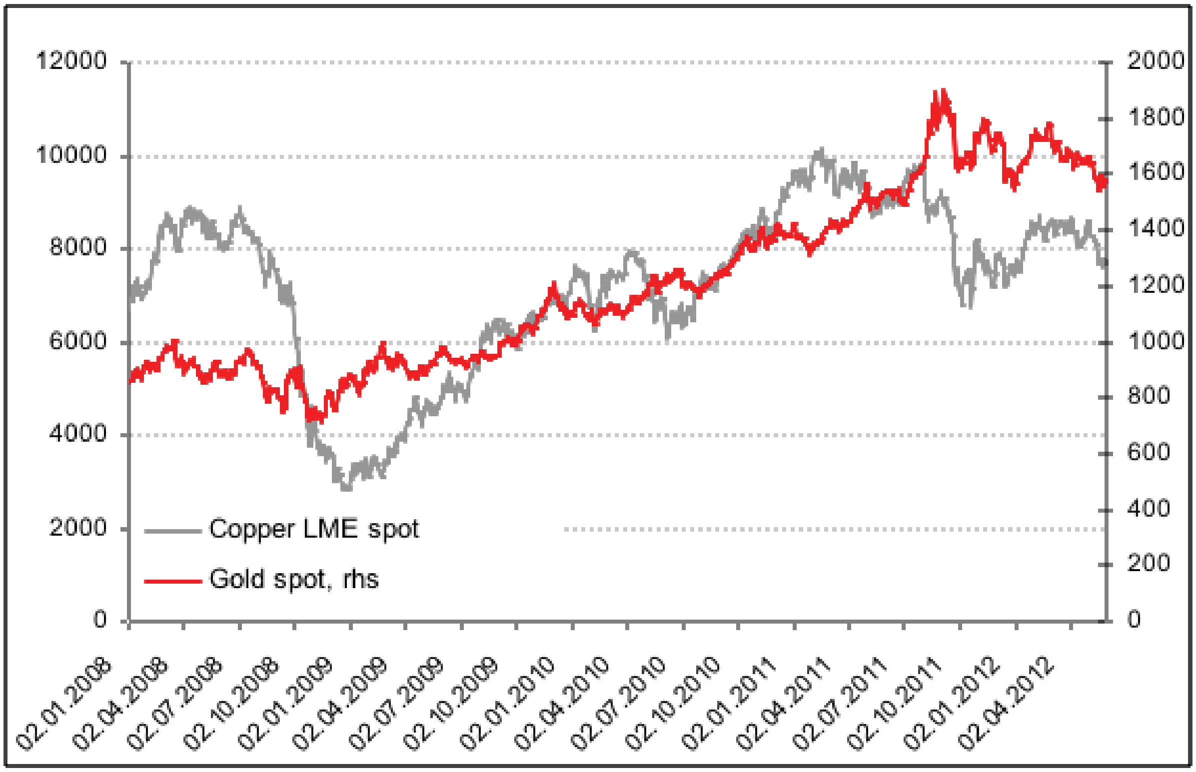


Figure 16.4
Relationship between Copper (LME) and Gold Prices 2008–2012



In other words, if you insist on trading options because of correlations between different underlying assets, consider the broadest spectrum of possibilities the market offers.

Other Misleading Grounds for Trading

Those months of high correlation between gold and oil in 2006 were the representativeness heuristic at work: we believe an entire data population will behave like the sample we're looking at. In general, whenever you hear the word "correlation," stay away. Everything correlates until it doesn't, and "it doesn't" occurs at the least opportune time. Since few guess correctly when correlations will break and why, it's dangerous to trade on them.

Equally misleading are assurances that forward prices reflect expectations for future prices or that the ratio between open interest on calls and puts reveals market expectations. We saw that gold producers curtail sales when they expect price increases. Producers and central banks leased their holdings for a fee, and the gold forward curve flattened as the supply available for leasing increased. Forward prices indicated that the market expected no price increases precisely when producers expected it to rise.

Conversely, you'd expect that an increase in put buying signals the market's expectation that prices of the relevant asset are about to decline. However, investors also buy puts to hedge long positions when they expect prices are about to rise. Whoever examines put volume in the abstract might believe the market predicts a decline when the opposite is true.

CHAPTER 17

Options, Psychology, Technical Analysis and Position Risk Management

Options speculating using technical analysis[67] is a natural transition for investors with some experience in both areas. This chapter reviews important issues and offers advice about structuring positions using technical analysis.

Technical Analysis and Psychology

Let's consider how options, technical analysis, and behavioral finance interact. Inexperienced investors are susceptible to the law of small numbers and the illusion of control from Chapter 6. That is, they're prone to find patterns where none exist. All of us have at one time "discovered" a pattern that wasn't there, probably when the market was range bound or trending slowly and we were bored. *Boredom-driven "discoveries" are as costly as fear-driven discoveries.* In both circumstances, take extra control over your decisions. The best solution is to avoid strategies that aren't "once in a lifetime opportunities."

Investors who use technical or fundamental analysis are vulnerable to the heuristics and biases discussed in Chapter 6. Markets move on current information and on forecasts. As the years since the 2007–2009 crisis have shown, fundamental forecasts can be very unreliable. Yet, these forecasts have as many fans as equally unreliable technical analysis. Ironically, the more certain we are about any of our forecasts, the more overconfidence skews our perceptions[68] because *a priori* we interpret incomplete information as support for our views. This is a humbling conclusion for those of us have experienced major failures on the back of excellent analytical conclusions.

The availability heuristic is treacherous during the early stages of trends because investors grab at all new information, particularly about unexpected market events and technical breakouts. For example, investors buy stocks after companies announce positive developments, such as better-than-expected earnings. As momentum builds, the herding heuristic nourishes our interest. Volume increases, and option traders enter the action. The defined trend normally smoothes volatility somewhat, and the options implied volatility smile may begin favoring the opposite direction.

Once a trend or range is established, the representativeness heuristic engages investors who trade the recognized pattern. Overconfidence swells as the pattern produces confirming signals, and more options selling reduces premiums as reflected by ever-lower implied volatilities. Lower volatility anchors expectations for stable prices, successively suppressing volatility further. Investors take bigger positions in the direction of the trend. They know volatility can erupt, but house money bias overshadows the deteriorating risk/reward potential.

Illusory correlations direct liquidity toward assets that may be correlated but dissimilar, as Chapter 17 discussed. When the market retraces, many investors will be holding the wrong positions, but, as prospect theory predicts, they can't bring themselves to place stop-loss trades. The market may become illiquid and start gapping. In options markets, illiquidity in the underlying and expectations for price gaps alter implied volatilities, creating a more pronounced smile as OTM puts rise in price. Market-maker spreads widen; hedging mistakes gets expensive. The anchoring heuristic becomes noticeable when investors miss their stop prices and many choose to wait out the market's reversal. Instead, it gets away from them. Only when experienced investors manage regret bias and avoid guilt over losses or over trading on improper signals.

Unfortunately, multiple heuristics generally operate simultaneously. If a technical pattern matures into a range or channel, investors influenced by anchoring heuristic frame trades referring to the range or the distance from the center of the channel. At the same time, the representativeness heuristic lulls investors into believing the market will remain within the channel or range. That's also true when markets build directional momentum and investors have a tendency to disregard the prospect of reverting to the mean.

Other Position Management Principles

Figure 17.1 shows the importance of discipline and of adhering to a plan of action.

Figure 17.1
Selling Microsoft Strangles

Source: Bloomberg

Imagine selling a strangle, setting strikes on either side of the indicated price channel (Figure 17.1). As the market approaches one of the strikes, your plan should include the action to take if the price continues beyond the channel. If implied volatility didn't increase following the channel break while a portion of the time premium has been amortized, you could perhaps buy back the short option without loss, although you'll rarely be that lucky.

If you believe the breakout will continue, you can place a stop-limit on the way back to the range and hedge with the underlying. If you believe the breakout is false, you might double the size of the short leg in that direction. However, even though you have many choices, they're mostly academic: with the market at a cusp you'll be tense and unreceptive to "creative ideas."

What you must do at that point is something counterintuitive that also accentuates your stress: *close the short leg in the direction counter to the move*. We repeat: this is a difficult advice to accept, but it's endorsed by reversion to the mean—the premise that markets spend three-quarters of their time within defined ranges. You'll believe in the breakout and think you don't need options in the opposite direction, but every probability suggests it won't happen, especially when the price must exceed support or resistance levels that have defined the range! Going back in the range with the entire short position in the opposite direction will not feel good.

We all know that there are many false breakouts and breakdowns. Yet even if you can overcome your stress, the counsel is hard to follow because you won't believe the reversion will occur soon. To enforce self-discipline, remind yourself that *option position risk management should be independent from market activity!* If you trade an underlying asset and focus on short-term positions, this reminder is difficult to accept. However, its wisdom becomes clear after experiencing the destructive power of mean reversion a few times as the market turns on a dime despite prevailing forecasts.

Looking at Figure 17.1 again imagine your emotional state in that situation. You need to buy back the part of a position that's counter to the breakout when your entire position is losing. *You need money to defend the weak side,* yet the correct action requires buying back the non-threatening strike while putting badly needed money into the side that's not threatening. The market won't reverse every time, especially when time remaining to expiration is short, but if the market turns you'll feel like a loser: you paid to defend the threatening leg, couldn't buy the other at a good price, and now must defend it. The situation tempts both fear and greed. However, once you follow this advice with an affirmative result, you'll be able to take larger future positions, convinced you've acquired the skill to fight adversity.

The logic leads to three points:

1. Don't leave inexpensive option risk open. Close it.
2. If a short option isn't cheap but *has lost half its value quickly* (let's say in a quarter of time to expiration) since you opened the position, buy back part of the position.
3. If you can buy back a previously sold option cheaply, don't be overly concerned about cost, even if it's unlikely that it will again increase in value.

Here's another observation about mean reversion. If you've decided to buy or sell based upon a very strong feeling of fear or greed, *take the opposite action*. When you feel an absolute certainty about something and there is urgency to take a position in that direction, everyone probably feels the same just before, the market reverses.

For instance, in 2012 when Apple exceeded $700 per share commentators started predicting it would rise to $1,000 per share after almost an 80% advance that year. The move was clearly overdone, but still difficult to countertrade because of the euphoria surrounding the stock. Let your emotional state of euphoria or ultimate depression be your barometer for the market, and observe your reaction to the market's behavior! You'll see it's hard to make decisions counter to majority option and your instincts.

Moving Averages

Now let's further consider legging in tactics discussed in previous chapters. Figure 17.2 shows the moving average crossovers in February and March. The difficulty using moving average crossovers is assuring the signals are valid. For example, had you acted on the initial false signal, you'd have incurred a loss, making subsequent signals hard to accept.

Figure 17.2
Crossover of the Averages on the Ford Chart

Source: Bloomberg

Since crossovers usually happen when the price is distant from the extreme point of the previous trend, it's stressful to open positions in their direction. It's even more difficult if you had already failed after a recent false signal. Besides, false signals reduce chances of implied volatility increasing. In this example, the spot price at the point of crossing the moving average hasn't yet declined sharply. Therefore, consider buying a 30-delta *three*-month put.

- Since there's less gamma risk if the spot price retraces,

- The implied volatility of mid-term options probably did not pick up, (implied volatilities of three-month options are less responsive to underlying price changes than of short-term options. Hence, buying them the first day after a sharp price decline of USD/JPY may be cheaper than buying one month OTM puts. In the event of a sudden retracement, three-month volatilities also won't react as fast as one-month volatilities).

- If the breakout doesn't occur quickly, loss from time decay will be acceptable.

- If the breakout is confirmed, implied volatility will gap up.

Why buy 30-delta, not 20-delta, puts? Because the 30-delta puts will be less expensive in implied volatility terms due to the smaller implied volatility skew. However, if you expect a significant move coming soon, the 20-delta put also can be suitable.

Reversal Patterns

Reversal patterns fall into two categories. The first is a reversal that occurs after lengthy trends or consolidations. The second is a reversal that follows a completed correction when the previous long-term pattern is reasserted. There are numerous reversal patterns. To assure your trading approach is consistent, observe reversal patterns as defined in Elliott Wave Theory that assumes market moves consist of five waves. Waves 1, 3, and 5 occur in the direction of the "impulse" (momentum), and retracements occur in the second and fourth waves. Each large retracement wave consists of smaller A-B-C waves. With each wave there is a change in direction.

The third wave (in the direction of the impulse) is the most powerful. All long-options directional investors always hope to capture the long-term impulse waves after second wave reverses. However, the second wave (retracement preceding the 3rd wave) can develop slowly. That is why to benefit from a likely 3rd wave employ strategies that provide both longevity (during the correction) and leverage (when the impulse proceeds). Normally, this means using long strategies with OTM options, those with deltas around 30 and below with more than one month to expiration, or risk reversals in the direction of the trend.

If you expect a quick reinstatement of the trend, following shallow corrections (normally intermediate waves), build your position using shorter-term OTM options. If you expect the correction pattern to persist, consider buying spreads in the direction of the impulse.

Check implied volatility to determine the appropriate structure since the influence of reversals on implied volatility varies at the different stages of the trend.

Influence of reversals on implied volatility varies at stages of the trend. If a reversal occurs after a long trend it increases implied volatility because everyone expects an explosive move of the underlying. However, if a reversal occurs after a retracement and returns the underlying to a well-established trend (for instance, near the end of the third wave), implied volatility usually declines.

If you suspect a reversal leading to a new trend buy 30-delta options with one to three months to expiration, depending on the strength of your conviction: the greater it is, the shorter term options you can buy.

For situations closer to the end of the trend or at its less volatile stage, it's better to use a two-week put spread or to spot hedged with a range forward, selling a 30-delta USD put, selling USD spot, and buying a USD call. As the spot returns to the previous, more stable trend, implied volatility of the option with the strike in the trend direction is more likely to decline. It's better to sell the spot and hedge it using a range forward.

By the way, what should be your plan if, after buying the OTM put, the market remains in correction mode instead of sharply selling off? You are long a put and risk the loss of time value; when the implied volatility starts declining you may start to lose conviction. In this situation do a reverse roll 2 to 1 (sell the original strike and buy a higher strike put). You'll end with a put with a higher strike without further investment, but you'll take a paper loss as you sell back the original option at a lower price. However, the new strike will hold its value better, and it will be less affected by theta or vega.

Head-and-Shoulders and Reverse Head-and-Shoulders

After the market has turned and broken the pattern neckline, false signals occur less frequently than during moving average crossovers. For these events, consider buying 20-delta one-month options in the direction of a breakout—i.e., for the leverage. Immediate impulse moves like that in Figure 17.3 seldom follow the breakout. If you bought delete a shorter-term options, you'll be nervous, as the market may halt or even retrace before continuing its breakout. However, given investment limitations buying medium term options with lower gamma options forfeits leverage.

Figure 17.3
Reverse Head-and-Shoulders Pattern on the Apple Chart

Source: Bloomberg

The more risky alternative is a seagull (discussed in Chapter 13)—buying a call and financing it by selling a strangle. For instance, buy a 450 call, sell a 400 put, and buy a 500 call.

The last variant is counterintuitive: back-spreads. For instance, *sell* a 450 call and buy two 470 calls with the same expiration (ratio spread) or *sell* a 470 call and buy two 500 calls with longer expiration. These combinations are called *backspreads*. The first strategy is a regular ratio spread in which you sell the strike that is closer to ATM. The second strategy is a combination of a short short-dated option with higher delta and a long longer-dated option with lower delta and larger notional value.

These strategies that are long more options than short benefit from increasing implied volatility, but they aren't obvious. While you guess the direction of the impulse, initially you lose, because you start by losing from gamma, and then, hopefully, profiting on the gain in vega.

Note the second strategy differs from the first because it attempts to time the market move.

An investor would have to expect a significant move after the expiration of the short short-dated option.

Island Reversals

Technical analysis books tend to illustrate island reversal patterns that are so perfect they could exist only in some divine realm. *Be suspicious about the validity of this pattern. Expect that* the figure predicts a price move or a price objective of the reversal (expected objective price for the move) that isn't likely to materialize *or that you won't have sufficient emotional conviction to open positions based upon them.* The key to watch is the volume. Be suspicious of island reversal that occurs on less than substantial volume. It's worth increasing your positions traded on this pattern as you gain comfort on each type of a signal on each type of an underlying. Since different underlying assets behave differently, keep initial positions small. By doing so you'll survive the inevitable failures before you determine to which extent this signal is reliable for any specific underlying.

Figure 17.4
Island Reversal and Hidden Divergence on the Rostelecom Share Chart

Source: Bloomberg

Figure 17.4 shows a perfect island reversal on the left and another on the right near the top that failed. Even if you ignored the false island reversal and believed that such patterns are always valid, it's unnerving to open a position on the day of a gap, for it's unclear where to place the stop.[69] Mindful of this difficulty, one useful option strategy in this situation is to buy a two-week ITM put with the strike at the level where you would normally place a stop for a short position in the underlying.

Hidden Divergence

You'll see a second signal in Figure 17.4: a *hidden divergence* denoted by arrows. It's an infrequently described but interesting technical signal. You see that the underlying is correcting from a slow trend, but the stochastic starts turning, signifying a likely return to the trend. The approach to creating an option strategy is analogous to the example of a return to a trend described in the graph showing moving average crossovers. If a hidden divergence appears at the beginning of a trend, you can buy options of any maturity. If it occurs when the trend has been under way for a while, buy short-term spreads and sell medium-term options.

Variations on Strategies

Many signals suggest similar options strategies. Let's analyze their variations.

Suppose you're long an underlying that's been trending higher and you use a collar to protect your gains by selling an OTM call and using the proceeds to buy an OTM put. How will you manage the position if you're correct about the direction?

There are several possibilities.

- Buy back the short call when the underlying reaches the downside objective of a correction. If the trend continues, roll the strike of the short call into a 2:1 into a longer maturity, while keeping constant the long position in the underlying.

- Buy back the short call and sell the long put if you expect a sharp acceleration of the trend. An alternative is to buy an option with a higher strike price, hedging the sold call.

- Roll the put into an option with a lower strike 1:2 if you expect the correction to continue.

- Let's review this roll in light of our discussion of backspreads. When you roll the long option with the notional of 1 into the option with the notional of 2, you create a backspread. This strategy has been popular with floor traders. It works well when you expect implied volatility to increase. On exchanges they tend to use something like a short one-month 30-delta call against three-month 15-delta calls on double notional. As noted, this variation has a timing component: one expects the move to occur after expiration of the short leg.

Don't forget to buy back the short options when they become cheap! The rule is worth repeating: If the sold option has lost half its value in a quarter of the time to its expiration, buy back part of the short position.

Fibonacci Ratios

Investors like using Fibonacci ratios for determining the price objectives of intermediate corrections. However, this technique is not as reliable as a standalone technical signal *except* in highly volatile markets. Yet used in conjunction with other technical tools it's useful in identifying which strike prices to set when buying or selling options. Fibonacci ratios seem more reliable when confirmed by other signals, as Figure 17.5 shows.

In this example, sell gold options with strikes placed beyond Fibonacci levels—for instance a 1400 call if you expect a quick move. Note the resistance around the .382 Fibonacci ratio number shown as the green horizontal line. Then watch for the end of the corrective wave by watching for a close above the Fibonacci level at .618 shown by the red horizontal line at 1560. This could be your first indication that the second wave has ended and the time has come to buy calls or call spreads.

Figure 17.5
Illustration of Resistance Confirmed
at the .382 Fibonacci Retracement Level on the Gold Chart

Source: Bloomberg

Option Strategies Using Elliott Wave Analysis

As you become more familiar with the analysis of Elliott Waves you'll be able to use the earlier discussion to create more trading strategies. You can use this section as a different way of looking for signals that come from traditional technical analysis.

We make the greatest profit if we buy options at the beginning of the third impulse wave. Since third impulse waves follow second corrective waves, then:

- Try to identify the end of second waves and buy options as the underlying trades above the top of the first wave high (for bullish momentum) and ideally at the beginning of the third impulse wave. This is a good place to use long call spreads.

- If at a later stage the trend has stabilized (the underlying asset is increasing (decreasing) at a 45 degree or smaller angle), sell options in the opposite direction, buy spreads in the direction of the trend, or buy a range forward in the direction of the trend.

- If a correction to a previous *relatively stable* trend is imminent, such as a fourth corrective wave, buy medium-term 30-delta options in the direction of the correction. As a rule, corrections to stable trends coincide with increased implied volatility. Since it's difficult to determine exactly when they will begin, avoid short-term options.

- If the correction lingers in unfolding, a range likely will appear. When trading inside a range, sell options at strikes within its boundaries to create a short strangle, a short straddle, or a short butterfly. If the range is broken before options expiration, hedge with the underlying in the direction of the breakout.

- If the correction forms a symmetrical triangle and you expect the trend to continue or reverse (B-Wave), try to buy implied volatility. Use medium-term options like straddles when you're unsure what direction the trend may take. Just make sure it is a triangle, rather than a mixed market pattern which normally develops in delayed corrections, in which the triangle likely is a so-called X-Wave.

- If a wedge in the direction of the trend appears on the graph, it's probably a wedging fifth wave. Rising wedges are generally bearish, whereas declining wedges are bullish. Therefore, wedges are generally counter-trend patterns, but their reversals are difficult to time; hence, buy longer-term spreads in the opposite direction.

CONCLUSION

This book boils down to a few principles:
Remember the relative values of options combinations
Trade less to earn more
Sell when you're scared, not when you're comfortable
Buy when you have the best investing idea of your life

Shortly after I started teaching traders and salespeople, I realized they couldn't speak more than a few sentences about well-known financial topics. As always when people don't know material in depth, they had little patience with long commentaries about what seemed simple issues. Traders seemed to learn best by losing money, and salespeople earned money when clients placed orders, not when they gave clients coherent advice. To help you avoid their fate, I've described simple strategies at length and explained ideas from various perspectives.

I realize some readers may not be *immediately* attracted to the book. Had someone offered me the insights I've shared here when I started trading, I'd probably only have skimmed them. Yet I saw their value after I traded directionally for a while, for directional trading with options is more complex than many suspect. When I was developing the strategies discussed here, several colleagues joined proprietary desks at funds. All of us had been delta-neutral traders by training. Everyone loses money before finding a logical approach to a new field, and I lasted longer than a year, primarily because I had a good teacher and experimented more successfully than my peers.

Problems teach you what it's important to learn, and you learn faster if you have a ready source of ideas. Being that source of ideas has been this book's objective. One distinctive feature of this book has been its focus on psychology. Perhaps you bought a call and the market started sliding. Watching prices slide, you prayed that some of your money could be salvaged. You stayed up all night, ate ice cream to bolster your hopes, and tried to avoid your spouse. It's fair to say you were consumed by stress. A year later, you'd forgotten those emotions and likely remembered only whether you made or lost money. But if you return to this book and reread relevant portions, you may realize what you'll do differently in the future.

Emotion and memory: the first fades, the second remains. Without recalling emotional context, facts no longer explain past actions. Just as dried fruit doesn't resemble fresh fruit, facts stored in memory don't reflect situations that formed them. Options are too treacherous to allow yourself incomplete comprehension, and useful feedback from experience alone may take a long time. You don't have the luxury of waiting weeks and months to contemplate your achievements and failures and merely "remember" them. You must learn from them quickly.

A ready reference will help you learn quickly. As always, some references will be valuable, and others will focus you on issues less important for trading. The point is that there are few accurate and relevant references around. The best references will guide you through detailed revisions of common concepts. This process is especially useful today. Few instruments other than options capture the direction of abrupt moves that characterize investing since the Great Recession. Options are powerful tools for making money and hedging risk, and like any tool they can damaging if used incorrectly. A more subtle statement is that, as with most things, when we start trading options we learn many general concepts and realize it takes time and experience to apply them. In gaining experience, we discover previously unmentioned or unresolved issues or issues mentioned only briefly and between the lines. This book has tried to address as many of those issues as possible.

Errors are random deviations from the norm. Like mutations, they're the basis of evolution. In evolving into an options investor, you'll undergo a process of changing your ideas many times. Most investors are wrong most of the time, but learning to manage your mistakes will return you to profit. Error correction is the basis of any progress, and hopefully this book will help you identify some errors.

INDEX

GLOSSARY

American-style Option – Options contracts that give buyers the right to exercise the option any time before expiration. US-listed stocks usually are accompanied by American-style options.

Arbitrage Profit – A transaction in which you profit through buying and selling the same option or an option strategy with the same risks. Also the potential created by the mispricing of one component of a position. Potential for arbitrage often arises in illiquid markets where, for instance, the price of a call may be too high compared to the price of the synthetic call (the put with the same strike and expiration date as the call plus long the underlying). Theoretical models assume price equilibrium without possibility for risk-free arbitrage, but in practice you can sell the call and buy the synthetic call and collect the profit. Another example of an arbitrage trade is selling the call on the OTC market at a higher price than the identical call costs on an exchange. In this case you take advantage of difference in pricing on different markets.

At-the-money (ATM) – Options with strikes at which the put/call parity is alligned, i.e. prices of the call and put are equal considering the level of the forward price (or broadly – interest rate differentials between the underlying asset yield and its financing cost).

AUD – Australian Dollar (A$)

Assignment – Process whereby option sellers (writers) fulfill terms of the options contact to sell stock from a call or buy stock from a put. Assignment occurs at expiration for European-style options. For American-style options assignment may occur any time prior to expiration. Assignment is a synonym of exercise.

Back spread –for instance, *short* a 52 call and long two 55 calls for the same expiration or *short* a 52 call and long two 57 call for longer expiration. These combinations are called *backspread*. The first one is a regular ratio spread in which you sell the strike that is closer to ATM. The second strategy is a combination of a short short-dated option with higher delta and a long longer-dated option with lower delta and bigger notional. These strategies that are long more options than short are oriented to gain from quick increases in implied volatility. The second strategy differs from the first because, it times the market move. An investor would have to expect a significant move after the expiration of the short short-dated option.

Bear Spread – Call or put spread combination that theoretically increases in value when the underlying asset declines in price. The position involves a long and a short option (two calls or two puts). In a bear spread (either a call bear spread or a put bear spread) an investor is long the option with the higher price strike and short the option with the lower strike price, both usually with identical expiration dates.

Bearish Strategy – One that theoretically increases in value when the price of the underlying asset declines.

Breakeven (Breakeven Point) – The price of an underlying asset at which the profit and loss of a strategy is zero.

Bull Spread – A call or put bull spread combination that theoretically increases in value when price of the underlying asset increases. The spread involves being long the option with the lower price strike and short the higher strike price, both usually with identical expiration dates.

Bullish Strategy – One that theoretically increases in value when the price of the underlying asset increases.

Butterfly (Butterfly Spread) – A three-legged option combination of all calls or all puts that is long or short two options (top and bottom strikes) against respectively short or long a middle strike. The total notional of the long and short positions is equal.

Calendar Spread (also **Horizontal Spread** or **Time Spread**) – A two-legged position, either calls or puts, with identical strike price but different expiration dates. Typically, the long-term option is purchased and the short-term option is sold.

Call Option – A contract providing the buyer with a right, but not the obligation to buy a stipulated amount of an underlying asset on a specific date at a defined price. The call seller is *obliged* to sell the underlying asset at the strike price at expiration (or before for American-style options), even if the underlying prices is higher.

Call Spread – An option strategy consisting of long and short call options with identical expiration dates but different strike prices.

Cap and Floor – see **Risk Reversal**

Cash – A term used for the underlying or more specifically its current market price for stocks and bonds with regular settlement and is equivalent to "spot" in the FX market.

CHF – Swiss Franc

Combo – see **Risk Reversal**

Contract Size – see **Face Value**, **Notional Value**

Cost of Carry – The cost to fund a position, typically the interest cost of a loan or margin requirement.

Currency Swap – Consists of two simultaneous deals, either to buy/sell (sell/buy) a spot contract and to sell/buy (buy/sell) a forward contract. Typically, an equal amount of the *first* (foreign) currency is sold while the second (domestic) currency is bought for settlement on a specific date.

Delta – The sensitivity of an option's premium to a change in the price of the underlying asset.

Delta Hedge Ratio – A calculated value used to determine the number of options that need to be bought or sold against another option position or the underlying asset to render the position indifferent to small changes in market price.

Delta Neutral (also **Neutral**, **Risk Neutral**, or **Hedged Position**) – A position formed by various combinations of options and underlying assets so that the theoretical profit and loss potential equals zero if the price of the underlying asset moves in the close range around the underlying price at which the position was put together.

Diagonal Spread – A combination consisting of two options with different expiration dates and strikes.

Directional Strategies – Combinations of options and underlying securities or currencies, such as long (short) call or put or risk reversal, that depend on the movement of the underlying asset in a specific direction in order to increase in value.

Domestic Rate – The interest rate used in FX option pricing that is paid on deposits in the country whose currency is in the denominator of the exchange, such as JPY in USD / JPY. It is the equivalent of a financing rate used for pricing stock options.

Dynamic Hedging – The process of maintaining a delta-neutral portfolio that assumes adjusting or re-hedging as the underlying asset price moves and the Greeks change.

Equivalent Position – see **Synthetic Position**

EUR – Euro currency (€)

EUR/USD (USD/JPY) – A currency combination that shows how many USD (domestic currency) it takes to buy one euro (foreign currency) or how many JPY it takes to buy one USD.

Expiration Date – The date an option contract expires or can be exercised in the case of Euro-style options.

Expiration – A term refers to an option terminating pursuant to the contract if not previously exercised. It has another meaning in case of exotic options.

Face Value (also **Notional Value** or **Contract Size**) – The stated amount of the contact.

FOREX (also **Foreign Exchange** or **FX Market**) – The global currency market.

Forward – see **Forward Contract**

Forward Contract (also **a Forward**) – a contract for the delivery of an underlying asset, such as currencies, on a specific future date at a price determined at the contracted time. Also called "deliverable forward" to distinguish from Non-deliverable forwards (NDFs.)

Forward Differential – see **Swap Points**

Gamma – The sensitivity of delta to changes in price of the underlying asset. The higher the gamma, the more delta changes when price of the underlying asset moves. Gamma reflects the *acceleration of delta* (acceleration of premium change) as the underlying asset moves in price. It is the second derivative of the option premium with respect to underlying price.

Greeks – Letters from the Greek alphabet that refer to parameters measuring various option characteristics, each having a corresponding Greek letter. The most widely used are *delta*, *gamma*, *theta*, and *vega* (not actually a Greek letter).

Hedging – Using combinations of long and short options and underlying assets to protect asset values.

Horizontal Spread – see **Calendar Spread**

In-the-money Option (ITM) – An option with intrinsic value. For calls, the strike price is below the current market price or current forward price of the underlying asset. For put, the strike price is above the current market price or current forward price.

Intrinsic Value – The portion of the option premium equal to the difference of the premium and option's time value. In other words, it is represented by the difference between the option strike price and the current market price of the underlying security. It is the gain received from exercising a put or call.

Iron Butterfly Spread - A strategy that consists of a long straddle and short strangle or vice versa. The notional of each of four legs is equal. All expire at the same time with an equal distance between the strike prices while both the risk and profit potential are limited.

JPY – Japanese yen (¥)

Leg – One part of an options strategy that combines various options, either puts or calls, at different strike prices and/or expiration dates.

Leverage – A general term for any technique that seeks to multiply gains but can produce extra losses by using borrowed funds. In other words, when you borrow money to increase the size of the position you can buy with your own funds. Futures contracts and options have greater leverage than a regular long cash position because they include embedded financing. Bank credit or margin extended by brokers increases the position size using assets as a collateral. "Five times leverage" means an asset is purchased with an initial equity payment of 20%, with the broker or bank lending the remaining 80% of the purchase amount. If the initial value of the asset is $100, a $5 price increase to $105 will be a 25% return on investment before interest costs. The greater the leverage, the greater the potential profitability and risk.

LIBOR – London Interbank Offer Rate. The average interest rate on short-term deposits in the London interbank market for various currencies between banks with the highest credit ratings.

Liquidity – An informal description for ability to buy or sell large quantities of an asset quickly with a reasonable spread between to bid and offer price. High liquidity is associated with large, high-volume markets such as US Treasury debt.

Long Position – The purchase of a security, including puts or calls. A long call position is bullish whereas a long put position is bearish about the anticipated price of the underlying asset.

Long Gamma Position (also **Long Gamma**) – An options combination with net positive exposure to changes in delta resulting from moves in the underlying security.

Long Vega Position (also **Long Vega**) – An option position that increases in value as the *implied* volatility rises.

Naked Option – An option that is unhedged by the corresponding underlying asset or another option.

Notional and **Notional Size**– see **Face Value**

Option – A financial contract giving the buyer the right but not the obligation to buy (call) or sell (put) an underlying asset before the contract expires in exchange for a premium payment.

Option Exercise (Assignement) – The procedure whereby an option holder notifies the seller of intent to exercise the option contract. Owners of calls exercise their rights to own the underlying asset, and owners of puts require sellers to pay for delivery of the underlying asset.

Option Expiration – The specified date and time after which the contract is no longer valid and exercisable.

OTC – Abbreviation for "over-the-counter" that generally describes markets which operate without a central exchange or clearing house. Some former OTC markets are now centralized utilizing clearinghouses, but substantial interbank trading continues in the traditional over-the-counter manner.

Out-of-the-money Option (OTM) – An option contract without intrinsic value, such as a call with the strike above the current market forward price or a put with the strike below a current market forward price. The premium for OTM options is equal to its time value.

Participating Forward – The simultaneous purchase (sale) of a call and sale (purchase) of a put with identical strike. The result is an option strategy whereby the profit/loss and risks are equivalent to an ordinary forward. The term is interchangeable with "synthetic forward."

P/L (also **P&L**) – Abbreviation for profit or loss from trading.

Position (also **Position** or "**the book**") – A combination of financial instruments with differing degrees of potential gain and risk comprising an investment portfolio.

Premium – represents the price paid or collected from an option transaction.

Premium Time Decay – see **Theta**

Put Option – A contract providing the buyer with the *right* (but not obligation) to *sell* a stipulated amount of an underlying asset on a specified date at a certain price for a European-style option or any time before expiration for an American-style option. Put *sellers* have an *obligation* to buy the underlying asset either at expiration for European-style options or at the buyer's request for an American-style option, even if the price is unfavorable.

Put / Call Parity – The equivalence relationship between the prices of call and put options (same strike and expiration) on the one hand and the underlying asset prices adjusted for financing costs and yields.

Put Spread – A position consisting of long and short puts with different strikes and identical expiration dates.

Range-bound Strategy – A position established with the expectation that price of the underlying asset will remain within a defined range. Strangles and straddles are examples.

Ratio Spread – A combination of long and short options of the same type (calls or puts) with identical expiration dates and different face values.

Release – The announcement of economic or political information, such as earnings or election results.

Resistance – A term of technical analysis describing a price level at which a likely influx of sell orders will reverse or delay further appreciation of the underlying asset.

Revaluation Level (“**Reval Level**”) – The spot/cash level or volatility and interest rate levels at which an option position is recalculated and/or adjusted.

Risk-Neutral Position – see **Delta-Neutral**

Risk Profile – A graphical representation of an option position’s risk.

Risk-Reversal (**Combo**, **Cap and Floor**, **Range Forward**, **Tunnel**, **Collar**) – A strategy that includes purchasing a call (put) and selling a put (call) with identical nominal values and expiration dates but different strikes.

Seagull – A three-legged option combination consisting of a long or short strangle and respectively short or long call or put inside the strangle. It can implement a range bound strategy with a directional slant (e.g., a short 90:100 strangle plus a long 95 put in expectation the market will trade below 95) or a premium-free directional bet with limited risk (e.g., a long 90:100 strangle plus a short 95 call in expectation the market will trade below 90. The loss from short 95 call is limited by the long 100 call.)

Settlement Date (**Delivery Date**, **Assignment Date**) – The date when payment is made or the asset delivered.

Short Position (also **Short Strategy** or **Bearish Position**) – A position that theoretically gains in value as the underlying asset declines in price.

Short Gamma Position (also **Short Gamma**) – An options position that loses value when the underlying asset moves in either direction.

Short Vega Position (also **Short Vega**) – An option position that loses money when *implied* volatility increases.

Spot (**Cash**) – refers to both the price of the underlying and the settlement delivery date. The spot delivery date for currencies is two business days after the trade date. "Spot" is the term used in FX and precious metals markets while "cash" used in stock and bond markets. For currencies, the spot settlement date may differ for each currency.

Straddle – A long or short options combination consisting of both the call and put on an underlying with identical strike and expiration dates, used primarily for volatility strategies.

Strangle – A long or short options combination consisting of a call and put with different strike prices and identical expiration dates. Used in a similar manner as straddles but provides a wider price range and a lower cost if bought or credit if sold.

Strategy – Any combination of financial instruments used to implement market forecasts, either directional or direction neutral.

Strike (**Strike Price**) – The price stipulated in the option contract at which the call (put) buyer has the right to exercise (buy in the case of calls or sell in the case of puts) the underlying asset.

Support – A term in technical analysis that describes a price at which an influx of buy orders may stop or delay the price decline of an asset.

Swap Points (**Forward Differential**) – The FX market term used for the difference between spot and forward interest rates. The calculation is based on the interest rate differencial between the underlying asset yield and financing cost.

Synthetic Forward – see **Participating Forward** and **Synthetic Position**

Synthetic Position (**Synthetic Strategy**) – An options combination that takes on a risk profile similar to the underlying asset in a defined price range. They may also combine options with the underlying asset to achieve the desired risk profile or profit and loss equivalency. For instance, the profile of a sold forward is similar to a combination of long put and short call with identical strikes and expiration dates as the forward while the profit and loss of the forward and of the options strategy is equivalent. Also called a "synthetic forward."

Technical Analysis – An analytical method of price forecasting based on the historical record of prices and the patterns formed by price movements using historical price charts.

Theoretical Profit (**Paper Profit**) – An option position's unrealized profit as defined by an options pricing model.

Theta (**Decay**, **Time Decay**) – The parameter that measures sensitivity of an option premium to changes in the time remaining until expiration. The time value component of the option premium. Options with greater theta amortize time premium faster. Because time premium decay is a square root function, short- term options decay more rapidly than longer-term options.

Tick – Minimum increment in price of an underlying asset, which varies with different markets. In the FOREX market, a tick equals 10 pips. On exchanges, a tick is a minimal contract increment.

Time Decay – A term often incorrectly substituted for "theta," since time decay shows the loss of value assuming the interest rates for a specific point on the interest rate curve, while theta assumes the interest rates at the time when the option was priced. Most systems show theta when pricing and time decay when revaluing the positions.

Time Spread – see **Calendar Spread**

Time Value – The portion of option premium represented by the difference between its premium and the option's intrinsic value. Time value is sensitive to changes in the time remaining until expiration and in *implied* volatility.

Touch Option (**One-Touch Option**) – A type of binary option contract that specifies event conditions similar to those of a lottery where the holder gains only if a certain price level is reached.

Trigger (see **Barrier**) – another term for exotic options.

Underlying (**Underlying Asset**) – The security or currency that serves as reference for an option or futures contact. Anything can be an underlying asset, including shares, currencies, coffee, gold, and even weather!

USD – U.S. dollar ($)

Vanilla Option – A commonly used synonym for European-style options.

VAR (**Value-at-Risk**) – A method of measuring investment risk depending on market volatility and an underlying price movement.

Vega – An option valuation parameter measuring the sensitivity of option prices to changes in *implied* volatility. The greater the vega, the more an option price changes as implied volatility changes.

Vertical Spread – Bullish and bearish spreads are vertical spreads when they have an equal number of both long and short options. Long call (or a put) and short call (or a put) with different strikes but identical expiration dates.

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FOOTNOTES

[1] Aristotle, *Politics*, http://classics.mit.edu/Aristotle/politics.html.

[2] Mixon, S., *The Crisis of 1873: Perspectives from Multiple Asset Classes*, Société Générale Corporate & Investment Banking, December 2007.

[3] Mixon, S. *The Foreign Exchange Option Market, 1917–1921*, Société Générale Corporate & Investment Banking, January 2009.

[4] Poundstone, W., *Fortune's Formula: The Untold Story of the Scientific Betting System That Beat the Casinos and Wall Street*, (New York: Hill and Wang, 2005).

[5] Haug, E. G. and Taleb, N.N., *Why We Have Never Used the Black-Scholes-Merton Option Pricing Formula* (5th ed.), February 26, 2009.

[6] Higgins, L.R.: putandcall00higggoog .Higgins also mentions that an option combination called in London the Put-and-Call was called Straddle in New York.

[7] Castelli C., *The Theory of "Options" in Stocks and Shares,* London: F. C. Mathieson, 1877, http://archive.org/details/TheTheoryOfoptionsInStocksAndShares_437.

[8] Instead of exercising, the option's buyer can sell the option on the options market and receive a price equal to the difference between the option strike price and the current market price at expiration. It is the same in terms of the ultimate payoff for this analysis.

[9] We are analyzing the value of the position without considering the price paid for the options.

[10] 1 pip = .0001. In the fixed income world, this is the same as 1 basis point (b.p.)

[11] An example similar to this one was in published in Castelli's book in 1877.

[12] Castelli mentioned a similar configuration as well in the contest of an arbitrage between London and Paris markets.

[13] GBP – British Pound.

[14] Synonymously they are called the domestic and international currency, or the base and quote currency respectively.

[15] By the way, strike prices for options on currencies traded on the interbank market (where clients trade with banks directly) are set in relation to the forward price rather than the spot price. In other markets, strikes are set in relation to the current price ("spot" or "cash" price). In such cases, interest expense and yields are taken into consideration when pricing options in the same way, but the concept of forward price is less observable.

[16] The terms "theta," time decay," "decay," and "price decay" are used interchangeably in the vernacular.

[17] An example of calculating annualized time to expiration is a conversion of three months into ¼ of a year (to be exact, 91 / 365).

[18] In doing this exercise you'd discover that the financing component of puts and calls with identical strike prices differs more for strike prices that are further from being ATM because of the greater difference in delta. The larger (smaller) the delta, the smaller (larger) is the portion of theta attributable to financing. So that net financing cost / gain of calls and puts is the same.

[19] In currency markets the current trading price of the underlying asset is called "spot," and in the stock and bond markets the current trading prices are called "cash." The term "spot price" refers to the underlying asset, not the option.

[20] In single stock options the term "ATM option" implies the ATM *cash* strike, while for currency options traded in the interbank market the term implies the ATM *forward* strike.

[21] We say "almost" because ATM strikes of different expirations are different due to the forward / funding differentials between periods as well as different volatilities.

[22] The expression of price in USD pips helps better reveals the breakevens, because performance of Forex markets is measured in counter-currencies like in a couple of Apple / USD or pips of any counter-currency. However, in later tables we use the

price expressed in % of the currency (EUR – in the pairing of EUR / USD). This expression is more often used on the OTC markets,

[23] This phrase is an example of an inaccurate truism. It's more correct to say that *time value* of options is less sensitive to changes in volatility. In fact, the farther their strikes are from the ATM strikes the more investment in them is sensitive to changes in volatilities. In other words, the time values of options far ITM and far OTM react in a like way to volatility changes, as explained in the section on put / call parity in Chapter 2.

[24] Frequent re-hedging of long options positions often leads to reduced profits because it doesn't allow for gains in gamma to become profits. Frequent re-hedging of short options positions leads to losses because the market-maker

[25] The operative word is "almost." Some correction is set in consideration of "skew," as discussed below.

[26] An ATM option curve is a simple benchmark. Market-makers can alternatively use an option's surface that is comprised of approximate volatilities of options of all expiries and all deltas. See the following footnote.

[27] Together, volatility curves and skews for all periods give a "volatility surface." Many market-makers base portfolio revaluations on the volatility surface. That is, they compare the value of each option to its equivalent on the volatility curve rather than to the volatility of an ATM option for the relevant period.

[28] Here "theoretical" is a synonym for "virtual," because it's received by comparison to a volatility curve, which is a line that connects a few known volatility prices (e.g., for options expiring in one week, one month, two months, etc.). For prices for other periods (e.g., for an option expiring in one-and–a-half months) the ATM price is interpolated, i.e. *theoretical*. You'll discover its real value only when you close the entire portfolio.

[29] Shefrin, H.M. and Thaler, R.,"An Economic Theory of Self-Control," NBER Working Paper 208, July 1978.

[30] McIntosh, D., *Foundations of Human Society*, (Chicago: University of Chicago Press, 1969).

[31] Strotz, R. H., "Myopia and Inconsistency in Dynamic Utility Maximization," *Review of Economic Studies*, 23, 165–180.

[32] It is a discount utility function of emotions such as pleasure and disappointment.

[33] Also see Hershfield, H.E., "Future self-continuity: how conceptions of the future self transform intertemporal choice," *Annals of the New York Academy of Sciences* 1235:1, 30–43.

[34] McIntosh, D., *Foundations of Human Society*, (Chicago: University of Chicago Press, 1969).

[35] Strotz, R. H., "Myopia and Inconsistency in Dynamic Utility Maximization," *Review of Economic Studies*, 23, 165–180.

[36] He received the 2002 Nobel Memorial Prize in Economics for discoveries in behavioral finance.

[37] Kahneman, D. and Tversky, A., "Prospect Theory: An Analysis of Decisions under Risk," *Econometrica*, 1979 and "The Framing of Decisions and the Psychology of Choice," *Science*, 1981.

[38] Voltaire, *Candide*,
http://books.google.ru/books?id=40cGAAAAQAAJ&pg=PA3&lpg=PA3&dq=the+best+philosopher+of+the+province+Candid&source.

[39] Taleb, N.N., *Fooled by Randomness: The Hidden Role of Chance in the Markets and in Life* (2nd edition), Thomson, TEXERE, New York, 2004.

[40] Taleb concludes that a completely reliable model is unlikely because of "black swans"—the occurrence of rare, unpredictable events.

[41] De Bondt, W.F.M., and Thaler, R. "Does the Stock Market Overreact?", *The Journal of Finance*, Vol. 40, No. 3, Papers and Proceedings of the Forty-Third Annual Meeting American Finance Association, Dallas, Texas, December 28–30, 1984. (Jul., 1985), 793–805.
http://phbs.pku.edu.cn/bbs/images/upfile/2011-11/2011112221858.pdf.

[42] Munger, C., “On the Psychology of Human Misjudgment,” Speech at Harvard Law School, June, 1995. Munger’s speech presented a potential contradiction between heuristics: the representativeness heuristic makes people less rational by stimulating them to ignore all possible events. The anchoring heuristic impedes rationality through excessive believe in regularities.

[43] Lichtenstein, S., Fischof, B., and Phillips, L.D., Calibration of Probabilities: the State of the Art to 1980*,* Kahneman, D., Slovic, P., and Tversky, A., *Judgment Under Uncertainty: Heuristics and Biases*, (Cambridge: Cambridge University Press, 2001). The authors pointed out that feedback is an efficient remedy for overconfidence. Research confirmed that those who receive feedback change their ways, although often to an insufficient extent. Those who don’t receive it repeat the same errors in a series of similar experiments.

[44] Langer, E., “The Illusion of Control,” *Journal of Personality and Social Psychology*, 1975, Vol. 32. https://docs.google.com/viewer?a=v&q=cache:O9aVL3_eyewJ:doi.apa.org/journals/psp/32/2/311.pdf+E.+Langer,+%E2%80%9CThe+Illusion+of+Control,%E2%80%9D+Journal+of+Personality+and+Social+Psychology,+1975,+Vol.+32.&hl=ru&gl=ru&pid=bl&srcid=ADGEESgl-R3vfheF2amLe3AjxRbL-ReUk9FB2LFkAFJBLYHY8Z7vGyXnzvEGkYPRPu9cnc0mjgwRcHyACnORU7LNw4YxL9PtYqMUtRvJ04rH8I7Awrnsy3BLXQIqjWGSN8P5ySs4iKpw&sig=AHIEtbT01IN9wDSJMgiDFBsMF2X9E61T6Q.

[45] While a presumably optimistic individual, according to Langer, should exercise caution about experiencing the illusion of control, depressed people according to psychologist Seligman underestimate their ability to control their lives. Arguably, traders should try to stay away from both extremes.

[46] Thaler, R.N., “From Homo Economicus to Homo Sapiens,” *Journal of Economic Perspectives,*Vol.14, No.1, Winter 2000.

[47] Barberis, N. and Thaler, R., *A survey of behavioral finance*, NBER Working Paper N0.922, Sep. 2002, http://gsbwww.uchicago.edu/fac/nicholas.barberis/research.

[48] In this case, $10 is roughly the equivalent of paying $10 for a low-delta option.

[49] "A salient characteristic of attitudes to changes in welfare is that losses loom larger than gains. The aggravation that one experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount." http://www.hss.caltech.edu/~camerer/Ec101/ProspectTheory.pdf

[50] Bernoulli, D., "*Specimen theoriae novae de mensura sortis*," *Commentarii Academiae Scientiarum Imperialis Petropolitanea*, V (1738), 175–192. Translated and republished as "Exposition of a New Theory on the Measurement of Risk," *Econometrica*, 22 (1954), 23–36.
http://www.math.fau.edu/richman/Ideas/daniel.htm.

[51] Before you start trading on what you learn in this chapter, check your broker's margin requirements and other requirements. Each firm has individual rules.

[52] Remember that in absolute terms the theta of low-delta options (or deep ITM options) is below that of ATM options. That's why theta of an ATM option with $1 million notional *in absolute terms* is higher than the theta of OTM / ITM options with $1 million notional. For example, a one-month 50-delta option trading at 40 cents (the models call this expression of options price "USD points") will lose 2 cents overnight, whereas a one-month 25-delta option trading at 27 cents will lose 1.5 cents. However, *in relative terms* options with lower delta depreciate faster. Hence $1 spent on an ATM option will lose value slower than $1 spent on an OTM option with the same expiration. To continue this line of thought, ATM options lose more value than OTMs with the same notional, but if you do a zero premium ratio spread and sell an equal value of the OTM options with a larger notional, the OTM position will have greater time decay.

[53] Whenever sellers of a single option want to take profits, they must consider buying a covering strike with a smaller notional rather than buying back the original option. This converts a simple strategy into one more complex, but it presents opportunity to increase profit by capturing possible gains within the close-middle strike distance. Although this idea seems rudimentary, most investors disregard it because they're uncomfortable with multi-stage options strategies.

[54] Since this is a debit spread (you paid the premium) it will have two breakeven points—low and high. The original breakeven of the vertical spread was 114 [110 + ($8 / 2) = 114], because you have two units of the close strike. When the original spread is converted into the ratio spread, the original breakeven becomes the low breakeven of the ratio spread. The ratio spread also will have a high breakeven

calculated the manner shown above. Note the premium should be divided by 2, not 4, because this is the difference between the notionals of the two strikes (4 −2). The debit of 4 (8 / 2) effectively reduces the high breakeven. That is, the result of 123 + [(123 −110)] x [2 / (4 – 2)] must be adjusted down by 8 / (4 −2). If you traded at a credit, to find the high breakeven you divide the credit by the difference in the notional of the strikes and add to the result of the calculation of the ratio spread breakeven.

[55] The second variant assumes an inverted volatility curve where one-month volatility is higher than three months. The third variant assumes the opposite.

[56] The actual term is "pips" not "cents."

[57] I learned these principles from Phil Halperin, who developed them after learning from other traders, who probably learned them from their predecessors back when delta hedging was known but not widely practiced.

[58] See Chapter 9, "Playing Defense: Enhanced Option Strategies for Unhedged Positions."

[59] Reminder: *Short gamma* consists of any hedging strategy based on selling short-dated options. *Long gamma* refers to a hedging strategy that results in being long gamma due to prevalence of shorter-term options. *Short vega* describes positions built of medium-long-term options, whereas a *long vega* position is constructed of long-term and medium-long-term options. These terms don't imply that you use only short-term or long-term options, nor do they ignore that short-term options are vega-sensitive, whereas long-term options are gamma-sensitive. The names emphasize the presiding sensitivities of options with a given maturity. However, to be specific about positions containing short-term and long-term options, you can say "short (or long) gamma, long (or short) vega." To be more specific, say, "Short gamma on the way up, long gamma on the way down," emphasizing changes of gamma in different directions of the market. Finally, there's *pin gamma*—gamma caused by the underlying crossing the strikes of options with overnight expirations. Pin gamma can be negative (produced by short expirations) and positive (result of long expirations).

[60] An interesting situation arises after dividends are declared. A stock's price should fall on the ex-dividend date, so theoretically you should re-hedge option positions one day before that date to anticipate the decline. In practice, however, prices don't fall by the exact amount of the dividend. It may make sense to adjust your hedge based

on the amount the share price historically corrects after going ex-dividend. Outlandish ex-dividend adjustments occasionally occur. In May 2012, Kazakh Telecom shares fell 60% on their ex-dividend date.

[61] The OTM call's premium is not greatly influenced by the forward differential, because its delta is very low. Hence, it doesn't hamper using the method to estimate the time value.

[62] http://leaches.net/moline/sermon--072.html

[63] The number 22.98 seems odd, like other numbers in the table, because market-makers trade in round numbers. Yet this is how systems show the prices originally because they use smooth, continuous volatility surfaces for expirations of one day or longer and for ATM option to OTM and ITM options. Volatility of options of all expirations and deltas is interpolated from a few reference volatilities for a few reference dates.

[64] Practitioners ignore the % sign and say "102."

[65] The customary spread on a one-year forward is 10 basis points for standard-sized OTC contracts (the standard trading lot is 100,000 ounces for one year and 32,000–50,000 ounces for 10 years). For 0–1-year contracts, the usual spread is 20–25 basis points.

[66] Table 16.2 reproduces Table 16.2.

[67] This chapter assumes slight familiarity with technical analysis and the Elliott Wave.

[68] Daniel, K., and Titman, S., "Market Reactions to Tangible and Intangible Information," Working Paper, September 21, 2001.

[69] If you were trading the underlying, this pattern would require placing a stop a bit above the opening price of the underlying on the day that follows a downside trend reversal (lower for an upside trend). If you had used this method in the situation shown by the graph, you'd ultimately make money on both signals, even if you were stopped out the second time.