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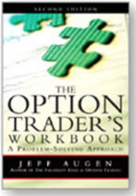

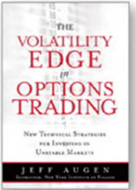

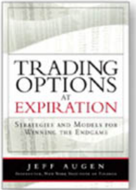

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THE OPTION TRADER'S WORKBOOK

SECOND EDITION

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THE OPTION TRADER'S WORKBOOK

A Problem-Solving Approach

Second Edition

Jeff Augen

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To Lisa and our little friends
both past and present—
Spokes, Hobie, Einstein, Regis, Rocky, Stella, Skooch,
Rugby, and Bonzo.

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Contents

Preface

There are two kinds of successful investors: those who admit to occasionally losing money and those who don't. Despite claims to the contrary, every investor loses money because risk always scales in proportion to reward. Long-term winners don't succeed by never losing; they succeed because their trades are well thought out and carefully structured. That said, very few investors recognize the impact of their own trading mistakes.

These mistakes can be subtle. The classic example goes something like this:

1. "I bought calls."
2. "The stock went up, but I still lost money!"

This frustrating scenario in which an investor correctly predicts a stock's direction but loses money is incredibly common in the option trading world. Leverage is almost always the culprit. More precisely, it is the misuse of leverage that stems from a fundamental misunderstanding of risk that so often turns investing into gambling with the simple click of a mouse. Option traders are famous for this mistake. They know, for example, that a sharp rise in the price of a stock can generate tremendous profit from nearly worthless far out-of-the-money calls. But lead is not so easily transmuted into gold. The problem is entangled with complex issues like collapsing volatility, accelerating time decay, and regression toward the mean. Institutional traders understand these issues and they rarely make these mistakes. Thousands of trades have taught them that not losing money is the very best way to generate a profit.

It's the thousands of trades, winners and losers both, that separate professionals from amateurs. Option trading is just like playing chess: It requires study and practice. The comparison is more valid than you might think. Both chess and option trading are governed by a complex set of rules. Risk analysis is at the center of both games; so is positional judgment and the ability to react quickly. Chess players learn to identify patterns; option traders, in their own way, must learn to do the same.

This book is constructed around these themes. It is designed to let investors explore a vast array of rules and trade structures by solving real-life problems. This approach differs markedly from the catalog of structured trades that seems to have become the contemporary standard for option trading books. Many fine texts have been written on the subject, but most build on this design with slightly different organization or a few novel trading ideas. Collectively they miss the point. Learning to trade options is an active process, best accomplished through doing rather than reading and memorizing. In this regard we have avoided the familiar but bewildering list that includes names like "reverse diagonal calendar spread," "condor," and "short strangle." In their place you will find more descriptive phrases like "sell the near-dated option and buy the far-dated option." But, more importantly, these descriptions appear in the context of trading situations in which the reader is asked to make a choice, predict an outcome, or design a correction. Moreover, the problems build on each other with each section progressing from basic to advanced.

Our goal was to challenge option traders at all levels. So take your time, work through the problems at a comfortable pace, and, most important of all, make your trading mistakes here instead of in your brokerage account.

Acknowledgments

I would like to thank the team who helped pull the book together. First and foremost is Jim Boyd who was willing to take the risk of publishing a new type of options book built around the problem-solving concept. His guidance and sound advice have added much clarity and organization to the text. Authors create only rough drafts—finished books are created by project editors. In that regard Betsy Harris was responsible for turning the original text into a publication-quality document. Without that effort the book would be nothing more than a collection of interesting math problems. I would also like to thank Cheri Clark who carefully read and edited the text.

It is always difficult for an author to be objective about his own work. That job fell to Arthur Schwartz who patiently checked all my calculations and made suggestions about new problems and examples.

Finally, I would like to acknowledge the excellent work of the Pearson marketing team. I've certainly learned a great deal about web-based digital marketing from working with Julie Phifer.

In these historic times of financial unrest, options have taken their rightful place as sophisticated investment vehicles. Making them accessible to a wider audience has been our principal goal.

About the Author

Jeff Augen, currently a private investor and writer, has spent more than a decade building a unique intellectual property portfolio of databases, algorithms, and associated software for technical analysis of derivatives prices. His work, which includes more than a million lines of computer code, is particularly focused on the identification of subtle anomalies and price distortions.

Augen has a 25-year history in information technology. As cofounding executive of IBM's Life Sciences Computing business, he defined a growth strategy that resulted in $1.2 billion of new revenue and managed a large portfolio of venture capital investments. From 2002 to 2005, Augen was President and CEO of TurboWorx Inc., a technical computing software company founded by the chairman of the Department of Computer Science at Yale University. His books include *Microsoft Excel for Stock and Option Traders*, *Trading Realities*, *Day Trading Options*, *Trading Options at Expiration*, *The Option Trader's Workbook*, and *The Volatility Edge in Options Trading*. He currently teaches option trading classes at the New York Institute of Finance and writes a weekly column for *Stocks, Futures and Options* magazine.

Notes

The following abbreviations will occasionally be used:

ATM = at-the-money (underlying security trades close to the strike price)

OTM = out-of-the-money (underlying security trades below the strike price of a call or above the strike price of a put)

ITM = in-the-money (underlying security trades above the strike price of a call or below the strike price of a put)

DITM = deep in-the-money (underlying security trades far above the strike price of a call or far below the strike price of a put)

DOTM = deep out-of-the-money (underlying security trades far below the strike price of a call or far above the strike price of a put)

Sqrt = Square root

StdDev = Standard deviations

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Covered Puts and Calls

Covered positions are used by conservative investors who are willing to accept a cap on their maximum gain in return for a hedge that can offset potential losses. Covered calls—long stock combined with short calls—are the most popular and best understood. Many investors find that covered calls are more profitable than simple long stock positions when the tendency is to hold the stock for a long period.

Bearish investors often take the same approach by shorting a stock and selling puts. As we will see, covered put positions display trading dynamics that are very different from their covered call counterparts. Most of the difference is related to spikes in implied volatility that often occur when a stock suddenly falls. Implied volatility spikes increase the price of the put side of a trade and, therefore, affect the way the trade must be managed.

It is also important to note that covered calls and covered puts are logically different with regard to the mechanism by which they are exercised. The two sides of a covered call are directly linked; the option is exercised by calling away the covering stock from the investor who sold the call. Conversely, when a put is exercised, the owner sells (puts) the stock to the investor who originally sold the option. If the original sale was covered with short stock, the investor who is assigned would simply offset his or her loss by purchasing the stock that was originally borrowed to create the trade. Both trades are covered in the sense that no additional collateral is required to protect the short put position.

In the option trading world it is more common to structure covered positions without any stock at all. Long calls substitute for long stock, and long puts replace short stock. A short option position is considered covered if the account is long a corresponding number of option contracts having more favorable terms—that is, the same or farther expiration date, and the same or closer strike price. These rules add additional complexity because the two sides of the trade can have different expiration dates. Various structures are possible and an appropriate set of names has evolved to describe them. Vertical spreads include long and short options with the same expiration date; calendar spreads span different expirations with the same strike price; diagonals have different strikes and expirations. Generally speaking, it is much more important to understand the trading dynamics of each structure than to memorize the names.

Finally, the term "covered" should not be misinterpreted as an indication that uncovered positions are always more dangerous. A single uncovered short put presents no more risk than 100 shares of long stock. Many investors miss this subtlety and lose the opportunity to create a large portfolio that benefits both from price movement and time decay.

In this section we will explore various covered positions, including pure option trades that span multiple expirations. We previously touched on covered trades in our discussion of simple long call positions. In that context we were either protecting profit after a rally or taking defensive action in response to a price decline. This section builds on those discussions with trades that are structured as covered positions from the outset. (All calculations for this chapter are based on a 1.5% risk-free interest rate.)

Traditional Covered Positions Involving Stock and Options (Problems #1–#23)

1. Which of the following positions are considered covered? (Assume a stock price of $47.)

    A. long 1,000 shares
    short 10 contracts—current month $50 call

    B. long 1,000 shares
    short 15 contracts—current month $50 call

    C. long 1,000 shares
    short 10 contracts—distant month $40 call

    D. short 1,000 shares
    short 10 contracts—current month $40 put

    E. short 1,000 shares
    short 10 contracts—distant month $60 put

    F. long 10 contracts—current month $50 put
    short 10 contracts—distant month $50 put

    G. long 10 contracts—current month $50 put
    short 10 contracts—distant month $40 put

    H. long 10 contracts—distant month $70 call
    short 10 contracts—current month $60 call

    I. long 10 contracts—distant month $60 call
    short 10 contracts—current month $60 call

    J. long 10 contracts—distant month $50 call
    short 10 contracts—current month $55 call

Answer: A, C, D, E, I, and J are covered. B is short 5 extra contracts. F and G are short the far-dated option. H is short the closer strike price. A short position can be covered by an equivalent number of shares of stock or the same number of option contracts with more favorable terms. The phrase "more favorable" refers to contracts that have the same or farther expiration date, and a strike price that is the same or closer to the underlying security. Stated differently, the covering options must have at least as many days left before expiration and a strike price that is at least as valuable as the short side of the trade.

2. Which trade is more bullish for a stock trading at $47?
   A. long 1,000 shares
      short 10 contracts—current month $50 call
   B. long 1,000 shares
      short 10 contracts—current month $55 call

Answer: B—the $55 call has less value and offers less downside protection in return for greater potential upside.

3. What is the maximum profit for the long stock/short call position shown in the following table? What stock price yields the maximum profit at expiration of the short call?

Stock Price	Long Shares	Short Call Price	Short Call Strike	Short Call Contracts
$47.00	1,000	$3.50	$50	10

Answer: $6,500 with the stock trading at $50. The stock will have a $3 profit, and the short call will expire worthless, returning $3.50 × 10 contracts = $3,500.

4. What would the break-even point be for question #3 at expiration of the short option.

   Answer: $43.50. This amount is equal to the initial purchase price of the stock minus the amount of premium taken in by selling 10 calls.

5. Suppose in question #3 we had chosen to sell deep in-the-money $30 calls for $17.50 instead of the $50 calls mentioned in the problem. Which short option position will provide the best return if the stock climbs to $50? Which provides the most protection if the stock falls to $45.

   Answer: With the stock at $50, we would be forced to buy back the $30 call for $20 (a $2.50 loss), and our stock would have a $3 profit. Our overall gain would, therefore, be only 50¢ as opposed to the $6.50 profit of the trade described in question #3.

   Conversely, if the stock declines to $45, the long stock position will lose $2 and the short $30 calls will be worth $15 ($2.50 profit). The overall position will, therefore, gain 50¢. Under the same circumstances, the short $50 calls will expire worthless and the entire $3.50 of premium will remain in the account, providing an overall profit of $1.50 ($2 loss on the long stock position + $3.50 gain from the short call position). Once again the short $50 calls provide the larger return.

6. At what expiration price are the two trades of the previous question equal? Which trade performs better if the stock falls further?

   Answer: A $3 decline in the stock price from $47 to $44 yields the same profit (50¢) for both trades because each of the short choices returns $3.50 at that price. The short $50 call that originally sold for $3.50 expires worthless, and the short deep in-the-money $30 call that originally sold for $17.50 would be worth $14 (its original price included 50¢ of time premium).

   The short $30 call offers extended protection if the stock declines below $44. Because DITM options have a delta near 1.0, the call price will decline in direct proportion to the stock price until the price falls below $30.

   Unfortunately, most options trading books and courses oversimplify the dynamics of complex positions. The most serious oversimplifications are those that evaluate positions at expiration and ignore the real time-management issues. Calculating the value of a position at expiration is far easier than deciding how to react to sharp price spikes that occur while the trade is open. Most of the remainder of this section is devoted to problems that address these issues.

7. The following table displays pricing data for the $50 call of problem #3 at four different stock prices with 54 days left before expiration. Suppose, as before, we purchased 1,000 shares of stock at $47 and sold 10 calls. What would the loss be if the stock fell to $44 after only 5 days and we closed the trade? What portion of the $3.50 downside protection were we able to take advantage of? Why?

Stock Price ($)	Call Strike ($)	Call Price ($)	Volatility	Days Remaining	Theta
47	50	3.50	0.65	54	–0.04
46	50	3.06	0.65	54	–0.04
45	50	2.66	0.65	54	–0.04
44	50	2.29	0.65	54	–0.04

Answer: Because the option has an initial value of $2.29 with the stock trading at $44, and theta is 4¢ per day, we can assume that it would be worth $2.09 after 5 days of time have passed ($2.29 – $0.04 × 5 days). Subtracting from the original value ($3.50) that we obtained by selling the option with the stock trading at $47 yields a gain of only $1.41. This gain offsets $1,410 of the $3,000 loss in the stock position. The difference ($1,590) is the final loss after we sell our 1,000 shares of stock and buy back the short calls for $2.09.

We were only able to utilize 40% of the original downside protection of the short $50 calls; the remaining 60% is locked up in time decay that can only be realized by keeping the trade open until expiration.

Note: When the underlying stock is trading out-of-the-money, theta can be used to accurately predict the price of an option over a relatively short timeframe. In this example, 5 days represents less than 10% of the remaining time, and all the option value is derived from time premium. Theta, therefore, is a very accurate measure of time decay and it can be used to predict the option price.

8. Consider the following scenario: You have a bearish view of a stock that is trading at $47, so you establish a covered put position by shorting 1,000 shares and selling $40 puts × 10 contracts. Two days later, the stock reacts to very negative financial rumors by plunging nearly 15%. With the stock now trading at $40, implied volatility soars to 180%. This scenario, depicted in the following table, was fairly common among financial stocks during the first quarter of 2008, when implied volatilities occasionally exceeded 400%.

Stock Price ($)	**Strike ($)**	**Days Remaining**	**Put Price ($)**	**Volatility**	**Delta**
47.00	40	54	1.66	0.65	–0.22
40.00	40	52	10.58	1.80	–0.37

Does this trade lose money? If so, would closing the trade be a good strategy for preventing further loss? What are the relevant numbers?

Answer: The trade will lose a substantial amount of money if it is closed after the large downward price spike. While the short stock position has gained $7,000 ($7 × 1,000 shares), the short put position has lost $8,920 (10 contracts × $8.92). Immediately closing the trade will cost $1,920. This unrealized loss is caused by the implied volatility spike that adds a substantial amount of time premium to the short option position. Closing the trade would be equivalent to throwing away the value of this premium.

9. If we keep the trade described in question #8, which of the following would be better?

   A. Stock falls another $5 to $35.

   B. Stock rises $5 to $45.

Answer: A. Our position would benefit if the stock continues falling because we are more likely to lock in the maximum gain at expiration when all remaining time premium has run out. If the stock closes at $45 on expiration day, we will keep $1.66 from the short put and gain $2 on our short stock position—the final gain will be $3.66 or $3,660. Conversely, if the stock falls another $5 before expiration, we will realize the maximum gain—$7 for the short stock plus $1.66 of time premium from the short put. Specifically, we will buy back 1,000 shares of short stock at $35 for a $12,000 profit, and the short put position, now $5 in-the-money, will lose $3.34 ($3,340). Total profit for the trade will, therefore, be $8,660.

10. Assume a scenario similar to that of the previous problem with one difference—we sell 10 puts at the $45 strike instead of $40. As before, we are short 1,000 shares of stock, the stock plunges to $40, and implied volatility climbs to 180%. These events are outlined in the following table.

Stock Price ($)	Strike ($)	Days Remaining	Put Price ($)	Volatility	Delta
47.00	45	54	3.59	0.65	–0.38
40.00	45	52	13.90	1.80	–0.43

We would likely establish this position because we are less bearish and would prefer the greater protection of the $45 put. Suppose that after the sharp decline we decide to buy back the $45 puts and sell the next lower strike—$40, as described in the following table.

Stock Price ($)	Strike ($)	Days Remaining	Put Price ($)	Volatility	Delta
40.00	40	52	11.71	2.00	–0.35

If the stock remains at this price until expiration, which short put provides the greater return? Why? Is the new trade more or less bearish than the original?

Answer: At expiration the $45 put will be worth $5 and the $40 put will be worth $0. Subtracting these values from their post-decline prices reveals that the $45 put has $8.90 of residual time premium whereas the $40 put has $11.71. Therefore, if the stock remains at this price and we hold the position until expiration, the $40 put will generate more profit. However, the transaction is complex because buying back the $45 put for $13.90 locks in a loss of $10.31 which is ultimately recovered in the sale of the $40 put. We can calculate the returns for each scenario as shown in the next two tables.

Scenario #1—Keep $45 short put until expiration (profit = $5,590)

Trade	Open	Close	Profit/Loss ($)
Short stock	Short 1,000 shares at $47	Buy to cover 1,000 shares at $40	7,000
$45 put	Sell 10 contracts at $3.59	Buy back 10 contracts at $5.00	–1,410

Scenario #2—Close $45 put and sell $40 put (profit = $8,400)

Trade	Open	Close	Profit/Loss ($)
Short stock	Short 1,000 shares at $47	Buy to cover 1,000 shares at $40	7,000
Short $45 put	Sell 10 contracts at $3.59	Buy back 10 contracts at $13.90	–10,310
Short $40 put	Sell 10 contracts at $11.71	Expires worthless	11,710

The new trade is less bearish than the first. It replaces a short put with a delta of –0.43 with a new option having a delta of

–0.35. Since short stock has a delta of –1.0, the original trade has a net delta of –0.57 and the replacement trade has a net delta of –0.65. In more practical terms, the short $40 puts provide less protection against a recovery in the stock price and allows greater profit if the stock continues falling.

11. How would the two scenarios outlined in the previous trade compare if the stock rallied back to $45 by expiration? (The scenarios are listed next.)

    Scenario #1
    short 1,000 shares at $47 and sell $45 puts (10 contracts)
    stock falls to $40
    keep trade as is
    stock rallies back to $45

    Scenario #2
    short 1,000 shares at $47 and sell $45 puts (10 contracts)
    stock falls to $40
    buy back $45 puts and sell $40 puts
    stock rallies back to $45

    Answer: Scenario #1 generates more profit because short $45 in-the-money puts provide greater protection against a rally than short $40 out-of-the-money puts. The two scenarios are outlined in the tables that follow.

Scenario #1—Keep $45 short put until expiration (profit = $5,900)

Trade	Open	Close	Profit/Loss ($)
Short stock	Short 1,000 shares at $47	Buy to cover 1,000 shares at $45	2,000
$45 put	Sell 10 contracts at $3.59	Expires worthless	3,590

Scenario #2—Close $45 short put and sell $40 put (profit = $3,400)

Trade	Open	Close	Profit/Loss ($)
Short stock	Short 1,000 shares at $47	Buy to cover 1,000 shares at $45	2,000
$45 put	Sell 10 contracts at $3.59	Buy back 10 contracts at $13.90	–10,310
$40 put	Sell 10 contracts at $11.71	Expires worthless	11,710

12. What is the maximum profit at expiration for the position outlined in the following table?

Position	Stock Price	Strike ($)	Option Price ($)	Days Rem.	Volatility
Long call	100	105	5.76	33	0.65
Short call	100	115	2.93	33	0.65

Answer: $7.17—the difference between the two strikes minus the cost of the original trade.

$5.76 long call – $2.93 short call = $2.83 original cost

$115 – $105 = $10.00 maximum value at expiration

$10.00 maximum value – $2.83 original cost = $7.17 maximum profit

13. In problem #12, are there any conditions that would cause the trade to gain more than $7.17 before expiration?

Answer: No, the maximum profit can only be obtained at expiration with the long call $10 in-the-money and the short call expiring worthless. No underlying price change at any point in the expiration cycle can yield a value for the long call that is $10 more than the value of the short call. The only exceptions are related to large differential volatility swings. The maximum profit can increase if implied volatility of the long call rises sharply relative to that of the short call. Distortions of this magnitude are extremely rare.

This section explores scenarios that involve a series of covered calls spanning four months. The sequence begins at December expiration with the stock trading at $104, and ends at April expiration with the stock at $108. Many different strike price and expiration date combinations are possible. We might, for example, respond to changes in the underlying stock price by selling a new batch of calls at a different strike each month. Alternatively, we could simplify the process by selling April calls once at the beginning of the process. Selecting the latter option, however, does not rule out the possibility of reacting to changes by adjusting the short call position.

The following table contains relevant pricing information for each of the four expirations. Because options expire on Saturday, each row contains a Friday start date and a Saturday expiration. For example, the first group expires on Saturday 1/19/2008 and the next group begins on the previous Friday 1/18/2008. The goal is to settle the current position and sell new options before the market close on the final trading day of the expiration cycle. Extending this logic to the final group in the table, we see that all trades are closed on Friday 4/18/2008 for options that expire the next day.

Stock Price ($)	Start Date	Expiration Date	Days Remaining	Strike($)	Call Price ($)	Volatility	Delta
104	12/21/2007	1/19/2008	29	105	4.86	0.45	0.50
104	12/21/2007	1/19/2008	29	110	2.97	0.45	0.36
104	12/21/2007	1/19/2008	29	115	1.72	0.45	0.24
104	12/21/2007	1/19/2008	29	120	0.94	0.45	0.15
112	1/18/2008	2/16/2008	29	115	4.42	0.45	0.45
112	1/18/2008	2/16/2008	29	120	2.75	0.45	0.32
112	1/18/2008	2/16/2008	29	125	1.63	0.45	0.21
112	1/18/2008	2/16/2008	29	130	0.92	0.45	0.14
97	2/15/2008	3/22/2008	36	100	4.23	0.45	0.45
97	2/15/2008	3/22/2008	36	105	2.60	0.45	0.32
97	2/15/2008	3/22/2008	36	110	1.52	0.45	0.21
97	2/15/2008	3/22/2008	36	115	0.85	0.45	0.13
94	3/21/2008	4/19/2008	29	95	4.35	0.45	0.50
94	3/21/2008	4/19/2008	29	100	2.51	0.45	0.34
94	3/21/2008	4/19/2008	29	105	1.35	0.45	0.21
94	3/21/2008	4/19/2008	29	110	0.68	0.45	0.12
108	4/18/2008	4/19/2008	1	95	13.00	0.01	1.00
108	4/18/2008	4/19/2008	1	100	8.00	0.01	1.00
108	4/18/2008	4/19/2008	1	105	3.00	0.01	1.00
108	4/18/2008	4/19/2008	1	110	0.00	0.01	0.00

14. For the timeframe beginning on 12/21 and ending on 4/19, which trade sequence generates the larger return? In percentage terms, what is the overall profit for this trade?

    Purchase 1,000 shares of stock on 12/21 and sell on 4/18.

    or

    Purchase 1,000 shares of stock and, for each expiration, sell 10 contracts at the first strike that is at least $5 out-of-the-money. As mentioned earlier, each option trade should be settled, and the next batch of calls sold, on an expiration Friday (12/21, 1/18, 2/15, 3/21). All trades are finally settled at the market close on 4/18.

    Answer: The stock position alone returns $4,000 while the covered call sequence returns $4,830. The following table outlines the gain or loss of the short call position at each expiration.

Expiration Date	Initial Stock Price ($)	Expiration Stock Price ($)	Strike ($)	Initial Call ($)	Final Call ($)	Gain/ Loss ($)
1/19/2008	104	112	110	2.97	2.00	0.97
2/16/2008	112	97	120	2.75	0.00	2.75
3/22/2008	97	94	105	2.60	0.00	2.60
4/19/2008	94	108	100	2.51	8.00	–5.49
					Total	0.83

The first three expirations return a profit of $6.32 but the final expiration loses $5.49, for a total short call return of only $0.83 ($830). Adding together the stock and short call profits yields a net return of $4,830. Since the total cost of the trade was 1,000 shares of long stock at $104, the percent gain is $4,830 / $104,000 = 4.64%.

15. In problem #14, what was the return for the short call portion of the trade? Was it necessary to set aside funds to collateralize the short calls?

Answer: In each case the short calls were covered with long stock so additional collateral was not required. Initial trade prices were $2,970, $2,750, $2,600, and $2,510—an average of $2,710. Dividing the return by this amount ($830 / $2,710) reveals that the short calls generated a profit equal to 31% of their value. Because there was no additional expense associated with the short calls, the revenue from their sale flows directly to the bottom line as profit that is measured against the cost of the long stock position (see problem #14).

16. In problem #14, would we have generated more profit by selling the nearest out-of-the-money strike for each month and taking in more premium, or selling the next further strike and taking in less premium?

Answer: Moving out to the next strike yields significantly more profit. Selling the closest out-of-the-money strike for each expiration results in a loss of $2.14 ($2,140) for the combined short option trades. Moving one strike beyond those of question #14 has the opposite effect—it generates a positive return of $3.22 ($3,220). The following tables provide detail for both cases.

Close Strikes

Expiration Date	Initial Stock Price ($)	Expiration Stock Price ($)	Strike ($)	Initial Call ($)	Final Call ($)	Gain/ Loss ($)
1/19/2008	104	112	105	4.86	7.00	–2.14
2/16/2008	112	97	115	4.42	0.00	4.42
3/22/2008	97	94	100	4.23	0.00	4.23
4/19/2008	94	108	95	4.35	13.00	–8.65
					Total	–2.14

Far Strikes

Expiration Date	Initial Stock Price ($)	Expiration Stock Price ($)	Strike ($)	Initial Call ($)	Final Call ($)	Gain/ Loss ($)
1/19/2008	104	112	115	1.72	0.00	1.72
2/16/2008	112	97	125	1.63	0.00	1.63
3/22/2008	97	94	110	1.52	0.00	1.52
4/19/2008	94	108	105	1.35	3.00	–1.65
					Total	3.22

In summary, the closest OTM strike results in a loss of $2,140; the next strike generates $830; the far strike yields $3,220.

17. How do the short call trades of the preceding three questions compare in percentage terms?

Answer: See the following table.

	Average Call Price ($)	Return ($)	Return
Nearest OTM Strike	4.47	–2.14	–48%
Nearest strike > $5 OTM	2.71	0.83	31%
Nearest strike > $10 OTM	1.55	3.22	207%

18. Why is the return so much larger for calls sold at the far strike price? (Hint: Measuring distances to strikes and price changes in standard deviations is helpful.)

Answer: Assuming a stock price near $100, we can calculate the approximate value of a 1 standard deviation price change for each 1-month timeframe as shown here:

Timeframes in 1 year	12
Annualization factor	Sqrt (12) = 3.46
Volatility for 1 month	0.45 / 3.46 = 0.13
1 StdDev change	0.13 × $100 = $13

The greatest loss (4/19 expiration) was caused by a price change of just over 1 standard deviation ($94 – $108) that was protected by an option sale of $4.35 for a strike just $1.00 out-of-the-money. Total protection for this sale was, therefore, only $5.35, or less than 0.5 StdDev. Selling calls that protect against small price changes is a bearish strategy that assumes mispriced volatility. The 1/19 expiration displayed similar dynamics: The short $105 call lost 44% on a price increase of approximately 0.6 StdDev.

19. In problem #17 we discovered that the largest return was generated by selling new options each month that were close to 1 standard deviation OTM. Suppose we decided, instead, to sell one batch of calls for the entire timeframe (120 days) that were approximately the same distance (1 StdDev) from the $104 starting price. Which row in the following table would be most relevant? How would the results compare to the monthly option sales of the previous problems?

Stock Price($)	Start Date	Exp. Date	Days Rem.	Strike ($)	Call Price ($)	Volat.	Delta
104	12/21/07	4/19/08	120	125	4.22	0.45	0.29
104	12/21/07	4/19/08	120	130	3.30	0.45	0.24
104	12/21/07	4/19/08	120	135	2.57	0.45	0.19
104	12/21/07	4/19/08	120	140	1.99	0.45	0.16

Answer: We can calculate the value of 1 StdDev for the 120 day timeframe as shown here:

Timeframes in 1 year[1]	65 / 120 = 3.04
Annualization factor	Sqrt (3.04) = 1.74
Volatility for 120 days	0.45 / 1.74 = 0.26
1 StdDev change	0.26 × \$104 = \$27.04

[1] We use calendar days for this calculation to precisely measure the fraction of a year that is represented by the entire timeframe. If we were calculating a daily price change, number of trading days (252) would provide a more appropriate metric.

Using these values, we can assume that we would sell the $130 strike price for $3.30 ($26 OTM). Since the stock closed at $108 on expiration day, the full amount would be realized as profit. In this case, the simple trade would generate approximately the same return as the more complex monthly sequence of option sales.

20. With regard to risk, how does the long-dated trade of problem #19 compare with that of the monthly trades? Do the results validate or conflict with option pricing theory?

Answer: Delta closely approximates the chance of an option expiring in-the-money. The monthly short trades had deltas of 0.24, 0.21, 0.21, and 0.21; the long-dated trade had a delta equal to 0.24. We can, therefore, conclude that the risk of expiring in-the-money was approximately equal for monthly and long-dated short calls. These dynamics make sense because monthly and long-dated strike choices were both based on a 1 standard deviation price change.

The results are a strong validation of option pricing theory because equal risks yielded comparable profits regardless of the timeframe. Selling more expensive closer strikes was not a good strategy because potentially larger profits were offset by greater risks that occasionally materialized into substantial losses.

Option traders frequently make the mistake of selling seemingly expensive near-dated options that exhibit high levels of time decay. This approach is flawed because correctly priced options have balanced risk:reward profiles regardless of the timeframe. However, monthly short sales can provide an advantage in rising volatility environments—bear markets being the most notable case. The following problems are designed with this concept in mind.

In this section we will explore scenarios that involve a series of covered puts spanning four months. The following table contains relevant pricing information. As before, each section's start date corresponds to expiration Friday of the previous section. The sequence begins at December expiration with the stock trading at $106, and ends at April expiration with the stock at $66.

Stock Price ($)	Start Date	Expiration Date	Days Remaining	Strike ($)	Call Price ($)	Volatility	Delta
106.00	12/21/2007	1/19/2008	29	105	4.79	0.45	–0.44
106.00	12/21/2007	1/19/2008	29	100	2.71	0.45	–0.30
106.00	12/21/2007	1/19/2008	29	95	1.34	0.45	–0.17
106.00	12/21/2007	1/19/2008	29	90	0.57	0.45	–0.09
98.00	1/18/2008	2/16/2008	29	95	3.48	0.45	–0.38
98.00	1/18/2008	2/16/2008	29	90	1.76	0.45	–0.23
98.00	1/18/2008	2/16/2008	29	85	0.75	0.45	–0.12
98.00	1/18/2008	2/16/2008	29	80	0.26	0.45	–0.05
103.00	2/15/2008	3/22/2008	36	100	3.78	0.41	–0.38
103.00	2/15/2008	3/22/2008	36	95	2.01	0.41	–0.24
103.00	2/15/2008	3/22/2008	36	90	0.92	0.41	–0.13
103.00	2/15/2008	3/22/2008	36	85	0.35	0.41	–0.06
78.00	3/21/2008	4/19/2008	29	75	3.75	0.60	–0.37
78.00	3/21/2008	4/19/2008	29	70	1.95	0.60	–0.23
78.00	3/21/2008	4/19/2008	29	65	0.85	0.60	–0.12
78.00	3/21/2008	4/19/2008	29	60	0.30	0.60	–0.05
66.00	4/18/2008	4/19/2008	1	75	9.00	0.01	–1.00
66.00	4/18/2008	4/19/2008	1	70	4.00	0.01	–1.00
66.00	4/18/2008	4/19/2008	1	65	0.00	0.01	0.00
66.00	4/18/2008	4/19/2008	1	60	0.00	0.01	0.00

21. For the timeframe beginning on 12/21 and ending on 4/19, which trade sequence generates the larger return?

    Short 1,000 shares of stock on 12/21 and close the trade on 4/18.

    or

    Short 1,000 shares of stock and, for each expiration, sell 10 puts at the first strike that is at least $5 out-of-the-money. As mentioned earlier, each option trade should be settled, and the next batch of puts sold, on an expiration Friday (12/21, 1/18, 2/15, 3/21). All trades are finally settled at the market close on 4/18.

    Answer: The stock position returns $40,000 while the covered put sequence subtracts $14,570. The net result is a profit of $25,430. The following table outlines the gain or loss of the short put position at each expiration.

Expiration Date	Initial Stock Price ($)	Expiration Stock Price ($)	Strike ($)	Initial Put ($)	Final Put ($)	Gain/ Loss ($)
1/19/2008	106	98	100	2.71	2.00	0.71
2/16/2008	98	103	90	1.76	0.00	1.76
3/22/2008	103	78	95	2.01	17.00	–14.99
4/19/2008	78	66	70	1.95	4.00	–2.05
					Total	–14.57

22. When a company reports very negative financial news that shocks the market, the resulting stock drawdown is normally accompanied by a sharp increase in implied volatility. Spikes of 300%, 400%, and even 500% are not uncommon in these situations.

Consider a covered put position that is short 1,000 shares of stock at $107 and 10 puts at the $105 strike as outlined in the following table. Line 1 of the table displays the starting put position, and line 2 reveals the results after a severe downward price spike accompanied by a large increase in implied volatility from 30% to 170%.

Stock Price ($)	Days Rem.	Strike($)	Put Price ($)	Volat.	Delta	Theta
107	29	105	2.61	0.30	–0.39	–0.06
80	25	105	31.61	1.70	–0.65	–0.26

How much money has the trade lost? Assuming that both implied volatility and stock price remain constant, how many days must elapse before the trade reaches a break-even point? How much will the trade recover if the stock closes at $80 on expiration day? What will the final profit be?

Answer: With 25 days remaining before expiration, the trade has lost $2 ($27 gain on short stock offset by $29 loss on short puts).

With a theta of –$0.26, approximately 8 days must elapse to recover the $2 loss ($0.26 × 8 = 2.08).

If the stock closes the expiration timeframe at $80, the trade will be worth $6.37 calculated as shown here:

Profit from short stock	$27.00
Sale of short put	$2.61
Cost to repurchase short put	–$25.00
Trade profit	$4.61

The final profit realized at expiration is a $2.61 improvement over the $2.00 loss experienced after the large downward spike displayed in the table. Overall, the combined stock and option trades generated a profit of $4,610.

23. Suppose that in problem #22 we responded to the sharp price decline by buying back our original short put position for $31.61 and selling new puts at a lower strike. Which of the choices shown in the following table generates the largest profit if the stock falls another $10? Which generates the most profit if the stock rises? Which choices generate at least as much return as the original $105 put if the stock remains at $80 until expiration?

Stock Price ($)	Days Rem.	Strike($)	Put Price ($)	Volat.	Delta	Theta
80	25	75	11.28	1.70	–0.36	–0.26
80	25	70	8.78	1.70	–0.30	–0.25
80	25	65	6.60	1.70	–0.24	–0.22

Answer:

Decline to $70: If the stock falls another $10, the short $70 strike that sells for $8.78 will generate the largest profit—the short stock will generate an additional $10 and $8.78 of premium will be realized when the options expire out-of-the-money. The more valuable $75 puts will generate $6.28 ($11.28 initial sale – $5.00 cost to repurchase), and the $65 puts will return the sale price ($6.60).

Protection against a rally: Of the three choices, the highest strike ($75) provides the most protection against a stock rally—it has the most negative delta and the most value. However, the original $105 short puts would provide superior protection. Keeping this trade open is the best choice if a price reversal seems likely.

Stock remains at $80: At the time of the downward spike, the original $105 puts were $25 in-the-money but traded for $31.61. Subtracting intrinsic from actual value ($31.61 – $25.00) reveals that the contracts had $6.61 of remaining time premium that must decay away before expiration. We can use this number for comparison against the three new choices, which each return their full sale price at expiration as they expire out-of-the-money. The first two choices yield higher returns than the original trade ($11.28 and $8.78). The third choice provides approximately the same return ($6.60).

Pure Option Covered Positions (Problems #24–#28)

The following section focuses on covered positions composed of equal numbers of long and short options in which the long side has more favorable terms (same or later expiration and same or closer strike). Many investors who trade covered positions favor this approach because it requires less capital, limits downside exposure, and benefits from leverage.

The following two tables display relevant pricing information for the problems that follow. The first table is organized by month and strike price. As before, each section's start date corresponds to expiration Friday of the previous group. The sequence begins at December expiration with the stock trading at $104, and ends at April expiration with the stock at $133.

The second table is composed of a single set of entries that span the entire timeframe. It provides long-dated option prices that complement those of the previous table.

Monthly Expirations

Stock Price ($)	Start Date	Expiration Date	Days Remaining	Strike ($)	Call Price ($)	Volatility	Delta
104	12/21/2007	1/19/2008	29	105	4.86	0.45	0.50
104	12/21/2007	1/19/2008	29	110	2.97	0.45	0.36
104	12/21/2007	1/19/2008	29	115	1.72	0.45	0.24
104	12/21/2007	1/19/2008	29	120	0.94	0.45	0.15
112	1/18/2008	2/16/2008	29	115	4.42	0.45	0.45
112	1/18/2008	2/16/2008	29	120	2.75	0.45	0.32
112	1/18/2008	2/16/2008	29	125	1.63	0.45	0.21
112	1/18/2008	2/16/2008	29	130	0.92	0.45	0.14
117	2/15/2008	3/22/2008	36	120	5.35	0.45	0.46
117	2/15/2008	3/22/2008	36	125	3.60	0.45	0.35
117	2/15/2008	3/22/2008	36	130	2.34	0.45	0.25
117	2/15/2008	3/22/2008	36	135	1.47	0.45	0.18
103	3/21/2008	4/19/2008	29	105	4.37	0.45	0.47
103	3/21/2008	4/19/2008	29	110	2.63	0.45	0.33
103	3/21/2008	4/19/2008	29	115	1.49	0.45	0.21
103	3/21/2008	4/19/2008	29	120	0.80	0.45	0.13
133	4/18/2008	4/19/2008	1	105	28.00	0.01	1.00
133	4/18/2008	4/19/2008	1	110	23.00	0.01	1.00
133	4/18/2008	4/19/2008	1	115	18.00	0.01	1.00
133	4/18/2008	4/19/2008	1	120	13.01	0.01	1.00

Long-Dated Expirations

Stock Price ($)	Start Date	Expiration Date	Days Remaining	Strike ($)	Call Price ($)	Volatility	Delta
104	12/21/2007	4/19/2008	120	100	13.53	0.48	0.62
104	12/21/2007	4/19/2008	120	105	11.17	0.48	0.55
104	12/21/2007	4/19/2008	120	110	9.15	0.48	0.48
104	12/21/2007	4/19/2008	120	115	7.45	0.48	0.42
104	12/21/2007	4/19/2008	120	120	6.02	0.48	0.36
104	12/21/2007	4/19/2008	120	125	4.84	0.48	0.30
104	12/21/2007	4/19/2008	120	130	3.87	0.48	0.26
104	12/21/2007	4/19/2008	120	135	3.07	0.48	0.21
104	12/21/2007	4/19/2008	120	140	2.44	0.48	0.18

24. Assume we purchase $105 calls with 120 days remaining and sell near-dated calls each month to offset time decay. Which sequence of strike prices would be most appropriate if our view is completely neutral as opposed to bearish or bullish? What would be the profit engine for such a trade?

Answer: Consistently selling the most expensive option (closest strike) creates positions that are essentially neutral because both sides have similar deltas. The trade would be designed to profit from time decay. The sequence is listed in the following table. (Note that we sold the $110 strike for the final month because we were already long the $105 strike.)

Expiration Date	**Strike ($)**	**Call Price ($)**
1/19/2008	105	4.86
2/16/2008	115	4.42
3/22/2008	120	5.35
4/19/2008	110	2.63

25. What would the profit or loss be in problem #24 for a trade consisting of 10 short and 10 long calls?

Answer: The collective trade gains $2.09 ($2,090 for 10 contracts), as shown in the next table.

Position	Expir. Date	Initial Stock Price ($)	Expir. Stock Price ($)	Strike ($)	Initial Call ($)	Final Call ($)	Gain/ Loss ($)
Short	1/19/2008	104	112	105	4.86	7.00	–2.14
Short	2/16/2008	112	117	115	4.42	2.00	2.42
Short	3/22/2008	117	103	120	5.35	0.00	5.35
Short	4/19/2008	103	133	110	2.63	23.00	–20.37
Long	4/19/2008	104	133	105	11.17	28.00	16.83
						Total	2.09

26. Would purchasing the far-dated $100 call create a more bullish or bearish position? Why? (Note: Assume that we would also adjust the short April position by shifting from the $110 call to the $105 call.)

    Answer: Initially it would appear that the higher delta of the $100 call represents a more bullish view. (The $105 strike of problem #25 had a delta of 0.55 and the new delta is 0.62.) However, the new trade is more bearish because it shifts the optimal return point from $110 to $105.

    The largest price increase occurred in April, and we are adjusting both the short and long positions for this month. On the long side we pay an additional $2.36 for the $100 strike, whereas the new short call only generates an additional $1.74. (Strike price spacing remains the same.) This difference represents an increased cost of $0.62 that is lost if the underlying stock closes above or below both strikes at expiration. However, if the stock closes April expiration nearly unchanged at $105, lowering both strikes provides a $5.00 improvement because the long side of the trade moves $5.00 in-the-money while the short side remains worthless. Since the initial position cost is increased by $0.62, the net improvement at expiration is $4.38. This improvement is reduced as the stock moves away from the $105 strike in either direction.

We can verify these numbers by calculating the return for each position with the stock trading at $105 at expiration. The original trade—long $105 calls / short $110 calls—would lose $8.54 if the stock closed April expiration at $105 ($11.17 loss on the long side offset by $2.63 gain on the short side). Shifting the strikes down $5.00 adjusts these values so that the long side loses only $8.53 ($13.53 initial cost – $5.00 value at expiration) which is partially offset by a gain of $4.37 on the short side for a net loss of $4.16. The improvement from an $8.54 loss to $4.16 loss is exactly equal to $4.38.

27. How would a trade structured using the far-dated $100 call for the long side and each month's nearest OTM strike for the short side compare with the position of problem #25?

Answer: Based on the answer to problem #26, we can predict that the new trade will generate a return that is $620 smaller—$1,470 as opposed to $2,090 for the original trade. The details are outlined in the following table.

Position	Expir. Date	Initial Stock Price ($)	Expir. Stock Price ($)	Strike ($)	Initial Call ($)	Final Call ($)	Gain/ Loss ($)
Short	1/19/08	104	112	105	4.86	7.00	–2.14
Short	2/16/08	112	117	115	4.42	2.00	2.42
Short	3/22/08	117	103	120	5.35	0.00	5.35
Short	4/19/08	103	133	105	4.37	28.00	–23.63
Long	4/19/08	104	133	100	13.53	33.00	19.47
						Total	1.47

28. Would the preceding trade yield a larger return if we sell monthly calls that are approximately 1 standard deviation out-of-the-money? How would we structure both sides of the trade so that it is still considered covered—that is, the long side has more favorable terms?

Answer: First we must calculate the value of a 1 StdDev price change for each timeframe.

Near-Dated Options

Timeframes in 1 year	12
Annualization factor	Sqrt (12) = 3.46
Volatility for 1 month	0.45 / 3.46 = 0.13
1 StdDev change	0.13 × \$104 = \$13.52
1 StdDev change	0.13 × \$112 = \$14.56
1 StdDev change	0.13 × \$117 = \$15.21
1 StdDev change	0.13 × \$103 = \$13.39
Average 1 StdDev change	\$14.17

Far-Dated Options

Timeframes in 1 year	365 / 120 = 3.04
Annualization factor	Sqrt (3.04) = 1.74
Volatility for 120 days	0.48 / 1.74 = 0.276
1 StdDev change	0.28 × \$104 = \$28.70

Using these numbers as a guide, we can select appropriate strikes and construct a table that includes prices and other relevant information.

Expiration Date	Initial Stock Price ($)	Strike ($)	Initial Call ($)	Delta
1/19/2008	104	115	1.72	0.24
2/16/2008	112	125	1.63	0.21
3/22/2008	117	130	2.34	0.25
4/19/2008	103	115	1.49	0.21

However, the requirement to select long-dated options with more favorable terms caps our strike price at $115. Additionally, because we have chosen this strike for the short April call, we must move closer and purchase the far-dated $110. This option is only $6.00 (0.21 StdDev) out-of-the-money for the 120-day timeframe. We can now complete a table that outlines the entire trade.

Position	Expir. Date	Initial Stock Price ($)	Expir. Stock Price ($)	Strike($)	Initial Call ($)	Final Call ($)	Gain/ Loss ($)
Short	1/19/08	104	112	115	1.72	0.00	1.72
Short	2/16/08	112	117	125	1.63	0.00	1.63
Short	3/22/08	117	103	130	2.34	0.00	2.34
Short	4/19/08	103	133	115	1.49	18.00	–16.51
Long	4/19/08	104	133	110	9.15	23.00	13.85
						Total	3.03

Reducing the risk of each short trade by selecting more distant strikes increased the return by 45% to $3,030. Additionally, with regard to the initial trade outlined in problem #25, the cost of the long April call was reduced by $2.02 while the short April call price only changed $1.14. Strike price spacing remained the same at $5. This dynamic locked in an additional 88¢ of profit because the stock closed above both strikes at April expiration.

Additional notes for problems #24–#28:

In the previous five problems the April price increase was the predominant force affecting profit. However, we have calculated that a 1 StdDev price change for the 120-day timeframe is approximately $29 and, therefore, the rise from $104 to $133 should not be considered a surprise. Unfortunately, it is difficult to structure covered calls against the April $130 or $135 strike on a monthly basis because some of the short sale candidates have virtually no value. More specifically, both the January and the April $135 calls would be worth only 10¢ at the time of sale. Generally speaking, it is more reasonable to allow short-term risk parameters for each short option sale to drive strike price selection.

Summary

Our discussion began with traditional covered calls that are structured with long stock and an equivalent number of short calls. As we have seen, the dynamics of position management change dramatically when long calls are substituted for long stock or long puts replace short stock, because stock always has a delta of 1.00 and options obviously do not.

The present discussion focused on covered trades in which the short side has less favorable terms and potential losses are somewhat limited. The next section will expand this discussion to include trade structures in which the time decay of a far-dated long position is offset by near-dated options with a more favorable strike price. Such trades, because they are uncovered, require a more sophisticated approach to risk management.

Finally, we will build on these dynamics with more complex structures that involve ratios where the two sides—long and short—contain different numbers of contracts. These trades can take many different forms, including some that are quite complex. All variations include uncovered short components. Risk management will play an increasingly important role as the complexity increases. Generally speaking, not losing money is the most efficient way for an option trader to generate a profit.

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