

Chapter 14

Options Markets

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Key Concepts

1. Explain why speculators take positions in stock options and how the outcome is determined.
2. Explain why institutional investors take positions in stock options and the tradeoff involved.
3. Explain how stock index options are used by institutional investors.
4. Explain how options on financial futures are used by institutional investors.

POINT/COUNTER-POINT:

If You Were a Major Shareholder of a Publicly Traded Firm, Would You Prefer That Stock Options Be Traded on That Stock?

POINT: No. Options can be used by investors to speculate, and excessive trading of the options may push the stock price away from its fundamental price.

COUNTER-POINT: Yes. Options can be used by investors to temporarily hedge against adverse movements in the stock, so they may reduce the selling pressure on the stock in some periods.

WHO IS CORRECT? Use the Internet to learn more about this issue and then formulate your own opinion.

ANSWER: Either argument has some validity. The main point is that students recognize the interaction between the stock price and option price. The trading of options can affect the stock price, but it may also stabilize the trading of the underlying stock.

Questions

1. **Options versus Futures.** Describe the general differences between a call option and a futures contract.

ANSWER: A call option requires a premium above and beyond the price to be paid for the financial instrument, whereas a financial futures contract does not contain such a premium. In addition, the call option represents a right but not an obligation, whereas a futures contract represents an obligation.

2. **Speculating with Call Options.** How are call options used by speculators? Describe the conditions under which their strategy would backfire. What is the maximum loss that could occur for a purchaser of a call option?

ANSWER: Call options are purchased by speculators when the price of the underlying stock is expected to increase in the near future. If the stock price declines, the strategy of purchasing a call option can backfire.

Call options are sold by speculators when the price of the underlying stock is expected to decrease in the near future. If the stock price increases, the strategy of selling a call option would backfire. The maximum loss to a purchaser of a call option is the premium paid for the call option.

- 3. Speculating with Put Options.** How are put options used by speculators? Describe the conditions under which their strategy would backfire. What is the maximum loss that could occur for a purchaser of a put option?

ANSWER: Put options are purchased by speculators when the price of the underlying stock is expected to remain stable or decrease in the near future. If the stock price increases, the strategy of purchasing a put option would backfire.

Put options are sold by speculators when the price of the underlying stock is expected to remain stable or increase in the near future. If the stock price decreases, the strategy of selling a put option can backfire. The maximum loss to a purchaser of a put option is the premium paid for the put option.

- 4. Selling Options.** Under what conditions would speculators sell a call option? What is the risk to speculators who sell put options?

ANSWER: Speculators sell call options if they expect the price of the underlying stock to remain stable or decline in the near future.

The risk to speculators that sell put options is that the price of the underlying stock declines.

- 5. Factors Affecting Call Option Premiums.** Identify the factors affecting the premium paid on a call option. Describe how each factor affects the size of the premium.

ANSWER: The greater the volatility of the underlying stock's price, the higher the premium. The higher the stock's existing price relative to the exercise price, the higher the premium. The longer the term to the expiration, the higher the premium.

- 6. Factors Affecting Put Option Premiums.** Identify the factors affecting the premium paid on a put option. Describe how each factor affects the size of the premium.

ANSWER: The greater the volatility of the underlying stock's price, the higher the premium. The lower the stock's existing price relative to the exercise price, the higher the premium. The longer the term to the expiration date, the higher the premium.

- 7. Leverage of Options.** How can financial institutions with stock portfolios use stock options when they expect stock prices to rise substantially but do not yet have sufficient funds to purchase more stock?

ANSWER: They could purchase stock options on various stocks to lock in the maximum price they will have to pay for those stocks. Once they have sufficient funds to purchase stocks, they can exercise their options (if it is feasible to do so).

- 8. Hedging with Put Options.** Why would a financial institution holding Hinton stock consider buying a put option on that stock rather than simply selling it?

ANSWER: If a financial institution is concerned about a possible temporary decline in ABC stock, but has favorable long-term expectations for the stock, it may purchase put options on ABC stock rather than sell its ABC stock.

- 9. Call Options on Futures.** Describe a call option on interest rate futures. How does it differ from purchasing a futures contract?

ANSWER: A call option on interest rate futures provides the right to purchase a specified financial futures contract that contains a specified price. The ownership of a call option on a financial futures contract allows one the right to purchase the underlying instrument on the settlement date specified by the futures contract. However, there is no obligation to do so unless the option is exercised. If one purchased a financial futures contract rather than a call option on the futures contract, there would be an obligation.

- 10. Put Options on Futures.** Describe a put option on interest rate futures. How does it differ from selling a futures contract?

ANSWER: A put option on interest rate futures provides the right to sell a specified interest rate futures contract that contains a specified price. The ownership of a put option on an interest rate futures contract allows one the right to sell the underlying instrument on the settlement date specified by the futures contract, if the put option on futures is exercised. However, there is no obligation unless the put option on futures is exercised.

Advanced Questions

- 11. Hedging Interest Rate Risk.** Assume a savings institution has a large amount of fixed-rate mortgages and obtains most of its funds from short-term deposits. How could it use options on financial futures to hedge its exposure to interest rate movements? Would futures or options on futures be more appropriate if the institution is concerned that interest rates will decline, causing a large number of mortgage prepayments?

ANSWER: The financial institution could purchase put options on interest rate futures. If interest rates increase over time, the reduced spread (between interest revenues and interest expenses) could be offset by the gain on a short position in futures. If interest rates decrease over time, the short position in futures would result in a loss. However, the put option on futures allows the financial institution the flexibility to avoid a short position in futures. The put option on futures is intended to hedge against increasing interest rates but remain exposed to interest rates if they decline in order to benefit from the decline.

If interest rates decrease, and mortgage prepayments increase, a put option on futures would be preferable to a sale of futures. The sale of futures would cause a loss on the futures position, whereas the put option on futures could go unexercised.

- 12. Hedging Effectiveness.** Three savings and loan institutions (S&Ls) have identical balance sheet compositions: a high concentration of short-term deposits that are used to provide long-term, fixed-rate mortgages. The S&Ls took the following positions one year ago.

<u>Name of S&L</u>	<u>Position</u>
LaCrosse	Sold financial futures
Stevens Point	Purchased put options on interest rate futures
Whitewater	Did not take any position in futures

Assume that interest rates declined consistently over the last year. Which of the three S&Ls would have achieved the best performance based on this information? Explain.

ANSWER: Whitewater would have achieved the best performance because its long-term, fixed-rate mortgages are insensitive to the lower interest rates, but its cost of funds would decline.

While Stevens Point can let its put options expire to avoid a short position in interest rate futures, it would have paid premiums on the options sold. Therefore its performance is not as high as Whitewater's.

- 13. Change in Stock Option Premiums.** Explain how and why the option premiums may change in response to a surprise announcement that the Fed will increase interest rates even if stock prices are not affected.

ANSWER: The option premiums will increase in response to increased uncertainty. A stock's value may remain the same while the uncertainty increases, which can result in higher premiums.

- 14. Speculating with Stock Options.** The price of Garner stock is \$40. There is a call option on Garner stock that is at the money, with a premium of \$2.00. There is a put option on Garner stock that is at the money, with a premium of \$1.80. Why would investors consider writing this call option and this put option? Why would some investors consider buying this call option and this put option?

ANSWER: If the investors expected that the stock price would remain somewhat stable, they could benefit from selling both options. They would receive more from premiums than their cost of fulfilling their obligations if the stock price remains close to its prevailing value.

Some other investors may expect that the stock price will be very volatile, although they do not know which direction the price will move. Therefore, they expect that they will exercise only one of their options, but a large price movement could earn a large gain that would more than offset the premiums they paid for both options.

- 15. How Stock Index Option Prices May Respond to Prevailing Conditions.** Consider the prevailing conditions that could affect the demand for stocks, including inflation, the economy, the budget deficit, and the Fed's monetary policy, political conditions, and the general mood of investors. Based on prevailing conditions, would you consider purchasing stock index options at this time? Offer some logic to support your answer. Which factor do you think will have the biggest impact on stock index option prices?

ANSWER: This question is open-ended. It requires students to apply the concepts that were presented in this chapter in order to develop their own view. This question can be useful for class discussion because it will likely lead to a variety of answers, which reflects the dispersed opinions of market participants.

- 16. Backdating Stock Options.** Explain what backdating stock options entails. Is backdating consistent with rewarding executives who help to maximize shareholder wealth?

ANSWER: Some firms also allowed the CEO to backdate options that they were granted to an earlier period when their stock price was lower. This enabled the CEOs to exercise the options at a lower exercise price. This activity occurred in the late 1990s and early 2000s but was not recognized until 2006. Backdating is completely inconsistent with the idea of granting options to encourage greater focus on maximizing the stock price. Instead, CEOs benefit when the options are backdated to some period in which the stock price was weak.

- 17. CBOE Volatility Index** How would you interpret a large increase in the CBOE volatility index (VIX)? Explain why the VIX increased substantially during the credit crisis. The CBOE volatility index (VIX) represents the implied volatility derived from options on the S&P 500 index (an index of 500 large stocks). An increase in the index suggests that market fear has increased, as investors who sell stock index options demand a high premium to incur the risk that the stock index might move substantially above or below the exercise price.

The VIX increased substantially during the credit crisis because there was much uncertainty surrounding the economy and stock valuations.

Interpreting Financial News

Interpret the following statements made by Wall Street analysts and portfolio managers.

- a. “Our firm took a hit because we wrote put options just before the stock market crash.”

Writers of put options on stocks are obligated to purchase those stocks at a specified exercise price if the options are exercised. The writers may then sell the stocks in the market at market price. When the market crashed, put options were exercised, and the writers were forced to pay for stocks at the exercise prices, which were much higher than the market prices (at which they could sell the stocks) after the crash.

- b. “Before hedging our stock portfolio with options on index futures, we search for the index that is most appropriate.”

The ideal index option would represent the same composition of stocks as the portfolio, so that any decline in the value of the portfolio could be offset by an equal increase in the value of put options. However, the options will not completely hedge against a market downturn because the underlying index will not normally be exactly the same as the portfolio being hedged. Therefore, the gain on the put options on an index during a market downturn will not exactly offset the loss on the portfolio.

- c. “We prefer to use covered call writing to hedge our stock portfolios.”

Covered call writing involves the sale of call options on stocks that are already owned. If the prices of the stocks decline, the losses are partially offset by the gains (premiums) earned from selling call options.

If stock prices decline substantially, covered call writing will not offset the losses as much as the alternative hedging strategy of purchasing put options. However, if stock prices remain somewhat stable, covered call writing would normally have better results because there would be

gains from the premiums received. Conversely, the strategy of purchasing puts would have required premiums to be paid, and the options would possibly remain unexercised.

Managing in Financial Markets

As a stock portfolio manager, you have investments in many U.S. stocks and plan to hold these stocks over a long-term period. However, you are concerned that the stock market may experience a temporary decline over the next three months, and that your stock portfolio will probably decline by about the same degree as the market. You are aware that options on S&P 500 index futures are available. The following options on S&P 500 index futures are available and have an expiration date about three months from now:

<u>Strike Price</u>	<u>Call Premium</u>	<u>Put Premium</u>
1372	40	24
1428	24	40

The options on S&P 500 index futures are priced at \$250 times the quoted premium. Currently, the S&P 500 index level is 1400. The strike price of 1372 represents a 2 percent decline from the prevailing index level, and the strike price of 1428 represents an increase of 2 percent above the prevailing index level.

- Assume that you wanted to take an options position to hedge your entire portfolio, which is currently valued at about \$700,000. How many index option contracts should you take a position in to hedge your entire portfolio?

The prevailing index is worth 1400, so that \$250 times the index is \$350,000. If the underlying index represents \$350,000, it would take two options contracts to create an underlying value of \$700,000.

- Assume that you want to create a hedge so that your portfolio will lose no more than 2 percent from its present value. How could you take a position in options on index futures to achieve this goal? What is the cost to you as a result of creating this hedge?

You could purchase two put option contracts on S&P 500 index futures with a strike price of 1372, which reflects a decline of about 2 percent from the present index value. Since the index was assumed to move in tandem with your portfolio, you are essentially hedging against movements in the index in order to hedge your portfolio. If the index level declines below 1372 (reflecting a decline of more than 2 percent), you may consider exercising the put options on index futures, which gives you the right to sell the index futures for a price of 1372. At the settlement date of the futures contract, you would receive \$250 times the differential between the futures price of 1372 and the index level. This creates the hedge for you, after a 2 percent loss.

There is a cost of creating this hedge. Since the put premium is $24 \times \$250 = \$6,000$ for one option contract, your cost is \$12,000 for two options on futures contracts.

- Given your expectations of a weak stock market over the next three months, how can you generate some fees from the sale of options on S&P 500 index futures to help cover the cost of purchasing options?

You could sell call options on S&P 500 index futures with a strike price of 1428 at a premium of 24. You would receive a payment of \$6,000 per contract (computed as $24 \times \$250$), or \$12,000 for

two contracts. The payments received could cover the payments needed to purchase put options on the S&P 500 index futures contracts.

However, by selling the call options, you are obligated to make a payment to the owner of the call options who exercises the option and purchases S&P 500 index futures. On the settlement date of the futures contract, you would pay an amount that is equal to the differential between the prevailing S&P 500 index level and the strike price of 1428 (assuming that the S&P 500 index level exceeds 1428 as of the settlement date). That is, if the index exceeds 1428 as of the settlement date, any further gain on your stock portfolio would be offset by the amount paid to the purchaser of the S&P 500 index futures. The strategy of selling call options on index futures is worth considering when you anticipate that the stock market will experience a decline, because under these conditions the call options that you sell would not be exercised.

Problems

- Writing Call Options.** A call option on Illinois stock specifies an exercise price of \$38. Today's price of the stock is \$40. The premium on the call option is \$5. Assume the option will not be exercised until maturity, if at all. Complete the following table:

<u>Assumed Stock Price at the Time the Call Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Writer (Seller) of the Call Option</u>
\$37	
\$39	
\$41	
\$43	
\$45	
\$48	

ANSWER:

<u>Assumed Stock Price at the Time the Call Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Writer (Seller) of the Call Option</u>
\$37	\$5
\$39	\$4
\$41	\$2
\$43	\$0
\$45	-\$2
\$48	-\$5

- Purchasing Call Options.** A call option on Michigan stock specifies an exercise price of \$55. Today the stock's price is \$54 per share. The premium on the call option is \$3. Assume the option will not be exercised until maturity, if at all. Complete the following table for a speculator who purchases the call option:

<u>Assumed Stock Price at the Time the Call Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Speculator</u>
\$50	
\$52	
\$54	
\$56	
\$58	
\$60	
\$62	

ANSWER:

<u>Assumed Stock Price at the Time the Call Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Speculator</u>
\$50	−\$3
\$52	−\$3
\$54	−\$3
\$56	−\$2
\$58	\$0
\$60	\$2
\$62	\$4

3. **Purchasing Put Options.** A put option on Iowa stock specifies an exercise price of \$71. Today the stock's price is \$68. The premium on the put option is \$8. Assume the option will not be exercised until maturity, if at all. Complete the following table for a speculator who purchases the put option (and currently does not own the stock):

<u>Assumed Stock Price at the Time the Put Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Speculator</u>
\$60	
\$64	
\$68	
\$70	
\$72	
\$74	
\$76	

ANSWER:

<u>Assumed Stock Price at the Time the Put Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Speculator</u>
\$60	\$3
\$64	−\$1
\$68	−\$5
\$70	−\$7
\$72	−\$8
\$74	−\$8
\$76	−\$8

4. **Writing Put Options.** A put option on Indiana stock specifies an exercise price of \$23. Today the stock's price is \$24. The premium on the put option is \$3. Assume the option will not be exercised until maturity, if at all. Complete the following table:

<u>Assumed Stock Price at the Time the Put Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Writer (Seller) of the Put Option</u>
\$20	
\$21	
\$22	
\$23	
\$24	
\$25	
\$26	

ANSWER:

<u>Assumed Stock Price at the Time the Put Option Is About to Expire</u>	<u>Net Profit or Loss per Share to Be Earned by the Writer (Seller) of the Put Option</u>
\$20	\$0
\$21	\$1
\$22	\$2
\$23	\$3
\$24	\$3
\$25	\$3
\$26	\$3

5. **Covered Call Strategy.**

- a. Evanston Insurance Inc. has purchased shares of Stock E at \$50 per share. It will sell the stock in six months. It considers using a strategy of covered call writing to partially hedge its position in this stock. The exercise price is \$53, the expiration date is six months, and the premium on the call option is \$2. Complete the following table.

<u>Possible Price of Stock E in 6 Months</u>	<u>Profit or Loss per Share If a Covered Call Strategy Is Used</u>	<u>Profit or Loss per Share If a Covered Call Strategy Is Not Used</u>
\$47		
\$50		
\$52		
\$55		
\$57		
\$60		

ANSWER:

Possible Price of Stock E in 6 Months	Profit or Loss per Share If a Covered Call Strategy Is Used	Profit or Loss per Share If a Covered Call Strategy Is Not Used
\$47	-\$1	-\$3
\$50	\$2	\$0
\$52	\$4	\$2
\$55	\$5	\$5
\$57	\$5	\$7
\$60	\$5	\$10

- b. Assume that each of the six stock prices in the table's first column has an equal probability of occurring. Compare the probability distribution of the profits (or losses) per share when using covered call writing versus not using it. Would you recommend covered call writing in this example? Explain.

ANSWER: There is a 50 percent chance that covered call writing will result in an additional \$2 per share gain. There is a 16.7 percent chance that the two possible strategies will generate the same gain. There is a 33.3 percent chance that covered call writing will result in a lower gain.

6. **Put Options on Futures.** Purdue Savings and Loan Association purchased a put option on Treasury bond futures with a September delivery date and an exercise price of 91-16. Assume the put option has a premium of 1-32. Assume that the price of the Treasury bond futures decreases to 88-16. Should Purdue exercise the option or let the option expire? What is Purdue's net gain or loss after accounting for the premium paid on the option?

ANSWER: Purdue should purchase a T-bond futures contract at 88-16 and exercise its put option to sell the contract at 91-16. Thus, it earns 3-00 per contract, which is 3.00 percent of \$100,000 = \$3,000. The option premium was 1-32 or 1.50 percent of \$100,000 = \$1,500. Therefore, the net gain is \$3,000 - \$1,500 = \$1,500.

7. **Call Options on Futures.** Wisconsin Inc. purchased a call option on Treasury bond futures at a premium of 2-00. The exercise price is 92-08. If the price of the Treasury bond futures rises to 93-08, should Wisconsin Inc. exercise the call option or let it expire? What is Wisconsin's net gain or loss after accounting for the premium paid on the option?

ANSWER: Wisconsin Inc. should exercise its call option in order to purchase Treasury bond futures at 92-08, and then sell the futures at the existing price of 93-08. The gain is 1-00 or 1 percent of \$100,000 = \$1,000. Since Wisconsin paid a premium of 2-00 or \$2,000, its net gain is \$1,000 - \$2,000 = -\$1,000.

8. **Call Options on Futures.** DePaul Insurance Company purchased a call option on an S&P 500 futures contract. The option premium is quoted as \$6. The exercise price is \$1,430. Assume the index on the futures contract becomes \$1,440. Should DePaul exercise the call option or let it expire? What is the net gain or loss to DePaul after accounting for the premium paid for the option?

ANSWER: DePaul should exercise its call option by purchasing the S&P 500 futures index for \$1,430 and then selling the index at \$1,440. The net gain is 4 (10 minus the \$6 premium). Since the S&P 500 contract represents \$250 times the index, the gain is \$2,000 (500 times \$4).

9. **Covered Call Strategy.** Coral Inc. has purchased shares of stock M at \$28 per share. It will sell the stock in six months. It considers using a strategy of covered call writing to partially hedge its position in this stock. The exercise price is \$32, the expiration date is six months, and the premium on the call option is \$2.50. Complete the following table:

<u>Possible Price of Stock M in 6 Months</u>	<u>Profit or Loss per Share If a Covered Call Strategy Is Used</u>
\$25	
\$28	
\$33	
\$36	

ANSWER:

<u>Possible Price of Stock M in 6 Months</u>	<u>Profit or Loss per Share If a Covered Call Strategy Is Used</u>
\$25	−\$0.50
\$28	\$2.50
\$33	\$6.50
\$36	\$6.50

10. **Hedging with Bond Futures.** Smart Savings Bank desired to hedge its interest rate risk. It was considering two possibilities: (1) sell Treasury bond futures at a price of 94-00, or (2) purchase a put option on Treasury bond futures. At the time, the price of Treasury bond futures was 95-00. The face value of Treasury bond futures was \$100,000. The put option premium was 2-00, and the exercise price was 94-00. Just before the option expired, the Treasury bond futures price was 91-00, and Smart Savings Bank would have exercised the put option at that time, if at all. This is also the time when it would offset its futures position, if it had sold futures. Determine the net gain to Smart Savings Bank if it had sold Treasury bond futures versus if it had purchased a put option on Treasury bond futures. Which alternative would have been more favorable, based on the situation that occurred?

ANSWER:

Results from Selling T-Bond Futures:

Selling Price of T-Bond Futures	\$94,000	(94.00% of \$100,000)
− Purchase Price of T-Bond Futures	− \$91,000	(91.00% of \$100,000)
= Net Gain	\$ 3,000	per contract

Results from Purchasing a Put Option on T-Bond Futures:

Selling Price of T-Bond Futures	\$94,000
− Purchase Price of T-Bond Futures	− \$91,000
− Premium Paid for Put Option	− \$ 2,000
= Net Gain	\$ 1,000 per contract

The results from selling the T-Bond futures were more favorable than the results from purchasing a put option on T-bond futures.

Flow of Funds Exercise

Hedging With Options Contracts

Carson Company would like to acquire Vinnet Inc., a publicly traded firm in the same industry. Vinnet's stock price is currently much lower than the prices of other firms in the industry, because it is inefficiently managed. Carson believes that it could restructure Vinnet's operations and improve its performance. It is about to contact Vinnet to determine whether Vinnet will agree to an acquisition. Carson is somewhat concerned that investors may learn of its plans and buy Vinnet stock in anticipation that Carson will need to pay a high premium (perhaps a 30 percent premium above the prevailing stock price) in order to complete the acquisition. Carson decides to call a bank about its risk, as the bank has a brokerage subsidiary that can help it hedge with stock options.

- a. How can Carson use stock options to reduce its exposure to this risk? Are there any limitations to this strategy, given that Carson will ultimately have to buy most or all of the Vinnet stock?

Carson could purchase call options on Vinnet stock so that it would lock in the amount it would pay for the stock if the acquisition occurs.

Carson would not be able to buy call options on all of the stock. In addition, by purchasing a large amount of call options, it will likely place upward pressure on the premium of the call options. There is a limited amount of call options that would be sold at the prevailing price and Carson will have to increase its price to buy a larger amount of call options on Vinnet stock.

- b. Describe the maximum possible loss that may be directly incurred by Carson as a result of engaging in this strategy.

The maximum loss is the premium paid for the call options.

- c. Explain the results of the strategy you offered in the previous question if Vinnet plans to avoid the acquisition attempt by Carson.

Carson would still have the call options. It may be able to profit from the strategy if it can sell the stock for a high enough price in the market before expiration in order to recapture the premium paid for the call options. If its acquisition attempt caused investors to bid up the price of the stock, it may not necessarily lose from its effort to hedge.