

# 10 The Options Market

## ■ Answers to Questions and Problems

1. State the difference between a call and a put option.

Call and put options are the two fundamental kinds of exchange traded options. They differ in the rights and privileges that ownership conveys. The owner of a call option has the right to buy the good that underlies the option at a specified price, with this right lasting until a stated expiration date. The put owner has the right to sell the good that underlies the option at a specified price with this right lasting until a stated expiration date. Thus, owning a call gives the right to buy and owning a put gives the right to sell. Correlatively, the seller of a call receives a payment and must sell the underlying good at the option of the call owner. The seller of a put receives a payment and must buy the underlying good at the option of the put owner.

2. How does a trader initiate a long call position, and what rights and obligations does such a position involve?

To initiate a long call position, a trader buys a call option. At the time of purchase, the trader must pay the price of the option, which the seller of the call collects. Upon purchase, the owner of a call has the right to purchase the underlying good at the specified call price with that right lasting until the stated expiration date. The owner of a call has no obligations, once he or she pays the purchase price.

3. Can buying an option, whether a put or a call, result in any obligations for the option owner? Explain.

The owner of a call or put has already paid the purchase price. After buying the option, the owner has only rights and no obligations. The option owner may exercise the option, sell it, or allow it to expire worthless, but the option owner is not compelled to do anything.

4. Describe all of the benefits that are associated with taking a short position in an option.

Taking a short position in an option involves selling an option. Upon the sale, the seller receives a cash payment. This is the only benefit associated with selling an option. After receiving payment for the option, the seller has only potential obligations, because the seller may be required to perform at the discretion of the option owner.

5. What is the difference between a short call and a long put position? Which has rights associated with it, and which involves obligations? Explain.

The short call position is obtained when a trader sells a call option. The seller of a call may be required to surrender the underlying good in exchange for the payment stated in the option contract. The short call position has a maximum benefit equal to the price that the seller received to enter the short call position. The short call position is most favorable when the price of the underlying good remains below the exercise

price. Then the seller of the call retains the full price of the option as profit. The higher the stock price above the exercise price, the worse for the call seller.

In a long put position, the trader buys a put option. Owning the put gives the trader the right to sell the underlying good at the stated exercise price until the option expires. The put purchaser profits when the price of the underlying good falls below the exercise price. Then the owner of the put can require the put seller to buy the underlying good at the exercise price. When the underlying good has a price above the exercise price, the long put trader cannot exercise and loses the entire purchase price of the option.

In contrasting the short call and the long put positions, we note that the short call trader has a maximum profit equal to the original sales price, and the long put trader has a maximum loss equal to the original sales price. For the long put position, there is the chance of a virtually unlimited profit as the stock price falls to zero. For the short call position, there is the chance of a theoretically unlimited loss, as the stock price rises toward infinity.

6. Consider the following information. A trader buys a call option for \$5 that gives the right to purchase a share of stock for \$100. In this situation, identify: the exercise price, the premium, and the striking price.

The premium is the same as the option price and equals \$5. The exercise price is the same as the striking price and equals \$100.

7. Explain what happens to a short trader when the option he or she has sold expires worthless. What benefits and costs has the trader incurred?

At the time of trading, the short trader of a put or call receives a payment. This is the only benefit the short trader receives from trading. If the option expires worthless, then the option was not exercised and the short trader attains the maximum possible profit. In selling an option, the short trader exposes himself or herself to the risk that the purchaser will exercise. For accepting this risk, the seller has received the option premium. If the option expires worthless, the short trader has escaped that risk.

8. Explain why an organized options exchange needs a clearinghouse.

The clearinghouse guarantees the financial integrity of the market and oversees the performance of traders in the market. If there were no clearinghouse, each trader would have to be concerned with the financial integrity of his or her trading partner. Assuring that the opposite trading party will perform as promised is difficult and expensive. With a clearinghouse, each trader has an assurance that the opposite side of his or her transaction will be fulfilled. The clearinghouse guarantees it.

9. What is the difference between an American and a European option?

A European option can be exercised only at expiration, while an American option can be exercised at any time prior to expiration. This difference implies that the American option must be at least as valuable as the European option.

10. Assume a trader does not want to continue holding an option position. Explain how this trader can fulfill his or her obligations, yet close out the option position.

The trader will be either long or short. If the trader is long, he or she can close the position by selling the exact same option. The option that will be sold must be on the same underlying good, have the same expiration, and have the same striking price as the original option that is to be closed. If the trader were short initially, the trader would close the position by buying the identical option. In essence, the trader closes the position by trading to bring his or her net position back to zero. Again, making sure that all characteristics of the option match is an essential condition.

11. A developer has purchased 60 acres of rural property just north of Augusta, Georgia, to develop a golf course. The golf course development will also include a housing development. In order to generate

operating capital, the developer is selling rights. The rights give the holder of the contract the right to purchase lots in the housing development for a fixed price. Each lot in the housing development is half an acre. The agreements expire six months after they are signed. The developer is offering the following inducement. A potential homeowner can purchase a lot for \$25,000 at the end of six months if the homeowner enters into the contract this week. The purchase price for a lot increases to \$40,000 on all contracts signed after this week.

- A. Describe the type of option being sold by the developer.

The developer is selling European call options.

- B. Describe the position held by the potential homeowner as an option.

The potential homeowner has a long position in the European call option sold by the developer. The potential homeowner is the person who decides whether to exercise the right to purchase the property.

- C. Discuss the risks associated with this transaction.

This is an over-the-counter transaction between the developer and the potential homeowner. The principal risk associated with this transaction is default (credit) risk. Both the developer and homeowner must be concerned with the possibility of the other party defaulting on the contract. However, the default risk is much lower for the developer. If the homeowner's check clears, then the developer has no default risk. However, the homeowner must be concerned with default by the developer at the end of six months.

- D. Suppose we purchased the rights on a corner lot on the eighteenth hole during the inducement period, and we have just found out that legendary golfer Tiger Irons is building a house on the same block. Explain what you think will happen to the value of the right that you own. Is this contract in-the-money?

This news will in all likelihood dramatically increase the value of the property in the neighborhood and thus the contract you own. A contract that permitted you to purchase the land at a below market value would be in-the-money.

- E. Suppose the developer was selling two contracts. One contract permits you to purchase a lot anytime during the six-month period, and the other allows you to purchase the lot only at the end of six months. Which of the two contracts is worth more? Explain why.

The developer is offering both American and European call options to potential homeowners. The American option must be at least as valuable as the European. It can be worth more if the underlying good has some payoff, analogous to a dividend on a stock, before the option expires. In this situation, it is not so clear that there is a "dividend" before expiration. With the revelation that a celebrity is moving into the neighborhood, the American option might be more valuable to the homeowner. The homeowner could exercise the option, acquire the property at below market value, and hold the property. The homeowner then has the option of selling the property immediately or at some date in the future, or the option to build on the property. The excess value of the American option over the European one depends on some incentive to early exercise. It is not obvious that there is such an incentive.

- F. To reduce your cash outflows shortly before it became public knowledge that Tiger was going to build a house in the development, you signed a contract with a colleague. This contract gives you the right to sell the lot anytime in the next six months to your friend for \$35,000. Describe your position and that of your friend.

You have a long position in an American put option that gives you the right to sell the property anytime in the next six months for \$35,000. Your friend has a short position in an American put option.

- G. Describe potential obligations associated with the options involving the developer and the two friends.

The original contract requires the developer to deliver the deed on the property for \$25,000 if the potential homeowner chooses to exercise the contract. Exercising the contract requires the potential homeowner to deliver \$25,000 in exchange for the deed to the property. The second contract gives the potential homeowner the opportunity to deliver the deed to the property to their colleague in exchange for \$35,000. Your friend must take delivery of the deed and make a payment of \$35,000 if you choose to exercise your right.

- H. Suppose the contract that you signed required you to sell the property to your colleague at the end of six months for \$35,000. What type of contract would this be?

This is a forward contract, since you must deliver the deed to the property at the end of six months to your colleague. You have a short position in a forward contract that requires you to deliver the deed to the property in exchange for \$35,000.

- I. Suppose that you signed the contract that required you to sell the property to your friend, but once you found out that Tiger was going to be your neighbor, you did not want to sell the property. What recourse is available to you?

One option would be to purchase the contract back from your colleague. However, your friend will have the power to capture all the gains associated with the increase in the value of the property. Thus, you will be negotiating from a position of weakness. Alternatively, you could repurchase the property from your friend at the current market price. If you were to default on the contract, your friend would take you to court and force you to live up to the terms of the contract. In addition, you would probably have to pay all the legal costs associated with your friend's court case, and any additional damages assigned by the court.

12. When you purchase or sell an option on the Chicago Board of Options Exchange you contract with the Options Clearing Corporation. Discuss the advantages of this type of trading arrangement.

The OCC acts as the buyer to every seller and the seller to every buyer. This arrangement increases the liquidity and marketability of exchange traded options contracts. If an investor wanted to reverse an options position, he or she could do so by submitting a reversing order to the options market. The investor is not forced to approach the original counterparty to negotiate a reversing transaction. In addition, every investor does not have to evaluate the credit (default) risk of other market participants. This reduces the cost of transacting in this marketplace, as each investor is concerned only with the credit risk of the OCC.

- A. If all trades in a day match, describe the net position of the clearing corporation.

If all trades match, then the OCC has a net zero option position.

- B. When a retail customer makes a margin payment, to which organization is the margin paid? Trace the flow of margin funds from the retail customer to the ultimate recipient.

A retail customer makes margin payments to his broker. If his broker is a clearing member firm, the broker will make margin payments to the OCC. If the broker is not a clearing member firm, then the broker will make margin payments to a clearing member firm and the clearing member firm will make the payments to the OCC. It is clearing member firms that make margin payments to the OCC.

13. Describe the services provided by a market maker, floor broker, and order book official. Discuss the differences between a market maker and an order book official.

A broker represents customer orders on the floor of the exchange. The broker is paid a commission for the provision of these services. The broker tries to fill orders as rapidly as possible at the best price available at the time of the transaction. The more orders the broker handles, the more commissions the broker earns. Order book officials represent public orders that are in the limit order book. They represent the exchange and have no equity positions in the market. They are responsible for maintaining an orderly and fair market in the handling of customer orders. A market maker holds a portfolio of options. A market maker manages her portfolio with the objective of maximizing her wealth. A market maker is required to trade a minimum number of options contracts at their quoted bid and ask price. Both market makers and order book officials maintain a portfolio of options. However, market makers trade to make a profit, and order book officials represent the orders of public customers (not professional traders).

14. During an extended period of financial difficulty, a firm's CFO offers the firm's treasurer the following contract in lieu of 25 percent of her salary. The contract permits the treasurer to "clip up to ten coupons" that entitle her to convert each coupon into 10,000 shares of stock at no cost anytime during a three-year period. Suppose the treasurer chooses to accept the contract. Explain what type of contract the treasurer holds.

Since the treasurer of the firm has the right to convert the coupons into a maximum of 100,000 shares of common stock anytime, the treasurer has a long position in an American call option written on the firm's shares. However, since the exercise price of the option is \$0, the treasurer effectively owns 100,000 shares of the firm's stock.

15. Explain the "rights" attached to a stock option contract traded on the CBOE. Discuss the economic motivation for exercising a stock option at expiration.

A call option is a contract that extends to the holder of the contract the right to buy 100 shares of the underlying stock at the specified strike price anytime during the life of the contract. The stock options traded on the CBOE are American options. A put option is a contract that extends to the holder of the contract the right to sell 100 shares of the underlying stock at the specified strike price anytime during the life of the contract. When making the decision to exercise an option at expiration, the owner of a stock option is in effect asking himself the following questions.

Call option:

Is it cheaper to buy 100 shares of the stock underlying the option in the market at the market (spot) price or via the contract (call option) at the contracted buying price? The contracted buying price is the strike price of the option.

Put option:

Do I make more money by selling 100 shares of the stock underlying the option in the market at the market (spot) price or via the contract (put option) at the contracted selling price? The contracted selling price is the strike price of the option. If the owner of the option finds it more profitable to trade the underlying stock according to the terms of the contract, then he will exercise the option.

16. Explain the obligations associated with establishing a long position in an option contract.

The purchaser of an option (the long position) must pay for the option before the market opens for business on the trading day following the purchase of the option. If payment has not been received by the market's opening, the OCC closes the position.

17. Explain the obligations associated with a short position in call and put options.

The writer of an option (short position) does not have any obligations if the option is not exercised. If the person has written a call option and the option is exercised against her, the writer must deliver the quantity of the underlying commodity specified by the option's contract. Upon delivery, the writer of the option will receive payment in the amount specified in the contract. If the person has written a put option and the option is exercised against her, the writer must take delivery of the quantity of the underlying commodity specified by the option's contract. Upon delivery, the writer of the option must make payment in the amount specified in the contract to the owner of the option's contract. When an option is exercised, the OCC randomly selects individual(s) from the pool of individuals who have open short positions in the relevant options contract. Thus, it is possible that an individual may have a short position in an option and not have the option exercised against her.

18. A trader purchases an option for \$6.50 that gives him the right to sell 100 shares of stock for \$50 per share. Identify the type of option, the option's price, and the option's strike price.

The investor is long a put option. The strike price is \$50, and the price of the option is \$6.50 on a per share basis. The total cost of the option is \$650 ( $\$6.50 \times 100$ ).

19. Consider the following "opportunities." Determine if the opportunity is an option, and if it is an option, explain what type of option the opportunity represents. Describe positions of the parties involved in the opportunity.

- A. An old college classmate calls and offers you the opportunity to purchase automobile insurance. The insurance is renewable semiannually.

Auto insurance is an American put option. If there is an accident involving an insured driver, then the insurance company makes a payment to the insured driver. The insurance company has written the put option. The insured is long the put option and “chooses” to exercise the option because of an accident.

- B. You have just received your SAT scores from ETS. It turns out that you had a good day and scored a perfect 1600. One week later, you receive the following offer in a letter from Private School U. If you enroll in PSU in the fall, PSU will guarantee that your total annual cost of attending PSU will be \$1. The offer applies only if you enroll at PSU for the upcoming fall semester.

You hold a long position in a European call option. PSU has written a call to you. If you enroll in PSU in the fall, then you have the right to purchase your education for the fixed price of \$1 per year.

- C. The following day your parents, who attended the local state-supported university, receive a letter from their alma mater, Basketball Power U. The letter makes the following offer. If their child enrolls in BPU for the fall semester, BPU will guarantee that they can purchase 10 courtside basketball seats for the face value of the tickets as long as their child is enrolled in BPU.

Your parents have nothing, but may come to have a long position in a portfolio of European call options. BPU has written the call options to the parents, contingent on the child’s enrollment. If their child enrolls in BPU in the fall and remains enrolled at BPU, then they will have the right to purchase 10 valuable courtside basketball tickets at BPU each year their child is enrolled at BPU. The offer applies only if their child enrolls at BPU for the upcoming fall semester and only for each year their child maintains enrollment at BPU.

- D. A high school classmate calls during dinner from his firm, High Pressure Telemarketing. He offers you the opportunity to enter into a long-term, fixed price, noncancellable lease on a condo in Miami Beach. This opportunity is not a time share, and you cannot sublet the condo.

This is not an option. There is no right associated with the contract. The contract requires you to make the fixed payments over the life of the contract. Once you enter into the contract, you have an obligation to make the payments, and you cannot choose to avoid a payment.

- E. You have just purchased 40 acres of heavily wooded land in the nearby hills. To minimize fire danger and relieve work-related stress, you plan to remove all the underbrush and dead trees from the property. The local hardware store is advertising a sale on chain saws. At the store, a sales consultant informs you that they are temporarily out of the saw that you are interested in. The salesperson offers you a rain check that gives the “opportunity” to purchase the saw at the sale price for two weeks.

You hold a long position in an American call option. You can return to the store anytime in the next two weeks and purchase the saw at the sales price if desired. The store has written the call giving you the right to purchase the saw at the sales price during the next two weeks.

- F. As usual things are running late. After work you run home to get dinner. Arriving home, you frantically search for the telephone book. In the middle of the telephone book, you find a coupon from the local pizza parlor, My Pies, that gives you the opportunity to buy a large supreme pizza and two liters of pop for \$15.99.

You are long an American call giving the right to purchase the pizza and pop for \$15.99. My Pies has written the call option.

20. Compare the obligations associated with exercising stock index options and stock options.

The fundamental difference between the two contracts is that the index option is a cash settlement contract. An index option contract is settled at exercise by an exchange of cash, while an option on an individual stock is settled by the delivery of shares in exchange for cash.

21. An investor holds a long option position that she wishes to close. Explain the different means available to the investor to close this options position. Explain how your answer changes if the option position was entered on an exchange or over-the-counter.

There are three ways this long option position can be closed. The investor can exercise the option, the investor can allow the option to expire worthless, and, if the option was entered on an exchange, the investor can enter into a reversing (offsetting) trade. To reverse the position, the investor must sell the same quantity of the option she owns. The options that she sells must have the same strike price and the same expiration date. With OTC options, if the investor wishes to reverse her position, she must arrange a reversing trade with the same counterparty with whom she initially contracted. If the investor must sell the option, the counterparty will have market power when negotiating the terms of the reversing transaction.

22. Suppose that there are two call options written on the same share of stock, XYZ. Both options have the same expiration date and strike price. Explain why the American option is always worth at least as much as the European option.

The American option contract has an additional right attached to the contract. This contract gives the option's owner the right to exercise the option anytime prior to the option's expiration. If this right to exercise early is worthless, then the value of the American option is the same as the value of a comparable European option.

23. Explain why the bid-asked spread quoted by the market maker on the floor of the CBOE represents a real cost to an investor trading options. Explain why the investor is willing to trade at the quoted spread prices in a competitive market.

If a trader wishes to trade an option listed on the CBOE, the trader must trade that option through the floor of the CBOE. In addition, the trader must trade the listed option at the price (spread) quoted by the market makers. The trader purchases the option at the market maker's ask price and sells options at the market maker's bid price. If market makers are informed and are correctly valuing the traded option, their quoted ask price should be above the fair value of the option and the quoted bid price should be below the fair value of the option. If there were no market makers in the market and the market was competitive with fully informed investors who correctly valued the traded options, then investors would trade options at the fair value of the option. The bid-asked spread represents compensation paid by market participants to the market maker. In a competitive marketplace, the market maker earns a fair return for bearing the risk associated with holding an inventory of option contracts, and for providing liquidity to the market.

24. Mr. Smith holds a certificate of deposit (CD) from his local bank that matures in three months. Mr. Smith is well aware of the current bull market for stocks, and the opportunity cost of having his money tied up in a CD earning 4.5 percent. When the CD matures, Mr. Smith is planning to invest in the stock market. Mr. Smith feels that the market will continue its strong bull run for the next three months, and he does not want to wait three months to invest in the market. Discuss how Mr. Smith may use options to invest in the market today. Explain the type of contracts and the positions Mr. Smith could use to undertake this investment.

Since Mr. Smith expects the value of the market to increase during the next three months, he should take a long position in a call option on the stock market. There are several different index options traded in the marketplace, including options written on the S&P 500, the S&P 100, the Russell 2000, and the Dow Jones Industrial Average. With a long position in an index call option, Mr. Smith can participate in the upward movements in the market with limited downside risk and a limited investment.

25. It is late in the afternoon of the third Friday of the expiration month, and an investor has an open long position in a deep in-the-money European call option. The investor must decide whether to sell the option in the market while the market is open or to exercise the option at the close of the market. For an option contract, the one-way transaction cost is \$25. The exercise fee for an option is \$25, and the commission for selling 100 shares of stock is \$20. Discuss the impact of transactions costs on the investor's decision to either exercise the option or sell the option.

Exercising the option requires two transactions by the investor, exercising the option followed by selling the stock. The cost of exercise is \$25, and the cost of selling the shares acquired by the exercise is \$20 for a total of \$45. Simply selling the option to capture the same underlying value will cost only \$25.

26. Consider the following option quotations.

Option IBM	Strike	Exp.	Call		Put	
			Vol.	Last	Vol.	Last
101 $\frac{5}{8}$	115	Sep	1632	$\frac{3}{16}$	10	13 $\frac{1}{4}$
101 $\frac{5}{8}$	115	Oct	861	1 $\frac{1}{4}$	10	14 $\frac{1}{4}$
101 $\frac{5}{8}$	115	Jan	225	4	3	14

A. What is the cost of 15 IBM Oct 115 call options?

$$15 \times \$1.25 \times 100 = \$1,875$$

B. Assume the clearing corporation is using the following schedule for the calculation of margin requirements:  
The maximum of:

100% of the proceeds from the sale of the options plus 20% of the value of the underlying stock position minus the dollar amount the option's contract is out-of-the-money, **or**

100% of the proceeds from the sale of the options plus 10% of the value of the underlying stock position.

What are the initial margin requirements for the buyer and seller of 3 IBM Jan 115 call options? Explain how the answer changes if the seller owns 300 shares of IBM.

If the investor owns 300 shares of IBM and chooses to lend them to his broker to collateralize his options position, then his margin requirement is \$0. This investor will have written covered calls. If the investor has written naked calls, then his initial margin is the maximum of:

First Method		Second Method	
100% of the proceeds from the sale of the option	$3 \times \$4 \times 100 = \$1,200$	100% of the proceeds from the sale of the option	$3 \times \$4 \times 100 = \$1,200$
20% of the value of the underlying stock position	$3 \times (\$101.625 \times 100) \times 0.2 = \$6,097.50$	10% of the value of the underlying stock position	$3 \times (\$101.625 \times 100) \times 0.1 = \$3,048.75$
The dollar amount that the options contract is out-of-the-money	$(\$101.625 - \$115) \times 3 \times 100 = -\$4,012.5$		
Required margin	\$3,285.00		\$4,248.75

The margin requirement is the larger amount of \$4,248.75.

C. Explain what happens to your option position if you are unable to meet a margin call.

A margin call requires the investor to recollateralize her margin position. If you do not have sufficient cash to recollateralize the position, the OCC reverses your position at the opening of the market on the next trading day. The existing balance in your margin account is used to cover your losses. The OCC also subtracts the relevant transactions costs from your margin account balances.