Options on Futures

An Introductory Guide

Chicago Mercantile Exchange

ENGINEERING MARKET FAITH℠

Of all the products introduced by Chicago Mercantile Exchange, none can match the versatility of options on futures. While futures are powerful tools in their own right, options on futures allow the trader the potential to profit in virtually any market environment. With options, traders can construct strategies that profit in advancing, declining or even stable markets, while at the same time reducing risk and increasing leverage. In addition, because options also can be used to protect against adverse price moves in livestock, interest rate, foreign exchange and equity markets, they have become an increasingly popular hedging vehicle. Today corporate treasurers, bankers, farmers and equity portfolio managers throughout the world benefit from using options as risk management tools.

Whether you are a trader or a hedger, one of the single most important advantages of options is that the option buyer has the potential to realize large profits while limiting risk to the amount paid up front for the option. However, before you incorporate options into your trading and risk management decisions, you should thoroughly investigate the risks, nomenclature and strategic uses of these instruments. The more background you have in options, the more likely you will be able to take full advantage of these powerful financial instruments.

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1. The Vocabulary of Options

Options are often thought of as difficult to learn – requiring numerical ability beyond most people. Actually, options are not difficult to understand once the basic vocabulary is mastered. Only the very advanced options concepts and strategies require any complex mathematics.

Option

An option is the right, but *not* the obligation, to buy or sell a particular futures contract at a specific price on or before a certain expiration date. There are two different types of options: call options and put options. Each offers an opportunity to take advantage of futures price moves without actually having a futures position.

Call Option

A call option gives the buyer the right to buy (go long) a futures contract at a specific price on or before an expiration date. For example, a September Yen 85 call option gives the buyer the right to buy or go long a Japanese Yen futures contract at a price of 85 (shorthand for $.0085/yen) anytime between purchase and September expiration. Even if Yen futures rise substantially above .0085, the call holder will still have the right to buy Yen futures at .0085.

Put Option

A buyer of a put option has the right to sell (go short) a futures contract at a specific price on or before the expiration date. For example, an October 70 Live Cattle put gives the put buyer the right to sell October Live Cattle futures at 70 cents/lb. Should Live Cattle futures decline to 64 cents/lb., the put holder (buyer) still retains the right to go short Live Cattle at 70 cents/lb.

Option Buyer

The buyer, or holder, of an option can choose to exercise his right and take a position in the underlying futures. The call buyer can exercise his right to buy the underlying futures and the put holder can exercise his right to sell the underlying futures contract. In most cases though, the option buyer does not exercise, but instead offsets the option in the market before expiration, if it has any value.

Option Seller

Option sellers (i.e., those who sell options that they didn't previously own) are also called option writers or grantors. The seller could be a trader or hedger and is contractually obligated to take the opposite futures position if the buyer exercises his right. In return for the premium, the seller assumes the risk of taking a possibly adverse futures position.

Puts and calls are separate option contracts; they are not the opposite side of the same transaction. For every put buyer there is a put seller, and for every call buyer there is a call seller.

The option buyer pays a premium to the seller in every transaction. The following table should be studied carefully so that options traders are aware of the rights and obligations associated with trading put and call options on futures.

Calls and Puts

Call Buyer	Call Seller
• pays premium • has right to exercise, resulting in long futures position • time works against call buyer • has no performance bond requirement	• collects premium • has obligation if assigned, resulting in a short position in the underlying futures contract • time works in favor of call seller • has performance bond requirement

Put Buyer	Put Seller
• pays premium • has right to exercise, resulting in short futures position • time works against put buyer • has no performance bond requirement	• collects premium • has obligation if assigned, resulting in a long position in the underlying futures contract • time works in favor of put seller • has performance bond requirement

Exercise Price

Also known as the strike price, the exercise price is the price at which the option buyer may buy or sell the underlying futures contracts. Exercising the option results in a futures position at the designated strike price. For example, by exercising a September Swiss Franc 60 (.6000) call, the holder of the option would then be long a September Swiss Franc futures contract at 60. If the holder of a June Live Cattle 70 put were to exercise his option, the result would be a short futures position, at 70, in June Live Cattle.

Strike prices are set by the Exchange and have different intervals depending on the underlying contract. Strike prices are set above and below the existing futures price and additional strikes are added if the futures move significantly up or down.

Underlying Futures Contract

The underlying is the corresponding futures contract that is purchased or sold upon the exercise of the option. For example, an option on a June Live Cattle futures contract is the right to buy or sell one such contract. An option on September Swiss Franc futures gives the right to buy or sell one September Swiss Franc futures contract.

Premium

The premium is the price that the buyer of an option pays and the seller of an option receives for the rights conveyed by an option. Thus, ultimately the cost of an option is determined by supply and demand. Various factors affect options premiums, including strike price level in relation to the futures price level; time remaining to expiration; and market volatility – all of which will be discussed further.

Exercise

Exercise refers to the process whereby the option buyer asserts his right and goes long the underlying futures (in the case of exercising a call) or short the underlying futures (in the case of exercising a put). Only option buyers can exercise options. Sellers of options have the obligation to take the opposite and possibly adverse futures position to the buyers' and for this risk they receive the premium.

Expiration Date/Last Trading Day

This is the last day on which an option can be exercised into the underlying futures contract. After this point the option will cease to exist; the buyer cannot exercise and the seller has no obligation.

Note that some options expire prior to the final settlement or expiration of the underlying futures contract. For example, a December 2001 Yen 85 call option will expire December 7, 2001. However, the underlying futures will expire December 17, 2001. The last trading day is the last day on which an option can be offset.

Offset

The buyer is under no obligation to exercise an option. As a matter of fact, many traders choose to offset their position prior to expiration. A trader will offset his position if he wishes to take profits before expiration or limit his losses on the downside. A buyer can offset his option by instructing his broker to sell his option before expiration. An option seller can offset his position by buying back or "covering" his short position. Options, like futures, trade on the CME floor where a market normally exists to offset options positions.

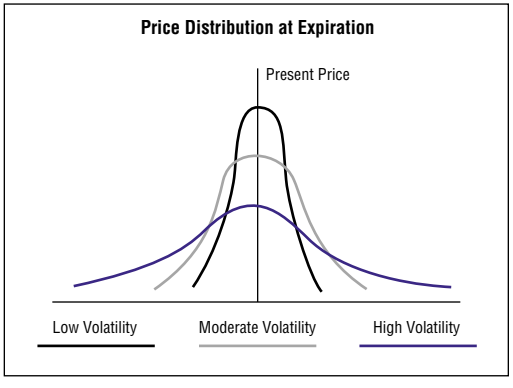
2. Some Options Fundamentals

When you buy an option you acquire the right, but not the obligation, to take a long or short position in a specific futures contract at a fixed price on or before the expiration date. For this right granted by the option contract you pay a sum of money or premium to the option seller. The option seller (or writer) keeps the premium whether the option is exercised or not. The seller must fulfill the obligation of the contract if the option is exercised by the buyer.

How are options premiums (or prices) determined? While supply and demand ultimately determine the price of options, several factors have a significant impact on option premiums.

1. The volatility of the underlying futures markets

Volatility is a function of price movement. When prices are rising or falling substantially, volatility is said to be high. When a futures contract shows little price movement, volatility is said to be low. High volatility generally causes options premiums to increase – sometimes very dramatically. Lower volatility environments generally cause options premiums to decline.



This is because when markets become volatile, option buyers are willing to pay larger premiums for greater protection against adverse price risk because there is greater chance of price change in the underlying instrument. On the other hand, a greater chance for price change means more risk for the option seller. He therefore demands a larger premium in exchange for this risk. It is much the same as insurance and insurance underwriters. If risk is perceived to be large, the insurance company will require a larger premium. If the risk is not large the insurance purchaser will not have to pay a large premium. With options, anytime there is a greater chance of the underlying futures advancing or declining through one or more exercise prices, risk is perceived to be greater and premiums will increase.

The Impact of Volatility on Option Premiums

	Low Volatility	Medium Volatility	High Volatility
Dec S&P 500® 1150 call option	8.50 pts.	11.40 pts.	14.20 pts.

The chart above shows that as volatility increases, options premiums increase. This effect can be significant. Options traders should be sure to address volatility before using these markets.

2. The exercise price compared to the underlying futures price—The relationship between the option's strike price and the underlying futures price is another key influence on option premiums. If S&P 500 futures are trading at 1150.00, common sense tells us that an 1130 call option will be worth more than an 1140 call option (the right to buy ten full points lower will be more costly). Similarly, an 1170 call option would be relatively cheap because the underlying S&P 500 futures is a full 20 points away from the exercise price.

3. Time remaining to expiration—An option's value erodes as its expiration nears. An option with 60 days until expiration will have greater value than an option with 30 days until expiration. Because there is more time for the underlying futures to move, sellers will demand, and buyers will be willing to pay, a larger premium.

The Effect of Time on Option Premiums

	60 days until expiration	30 days until expiration
June Swiss Franc 60 call option value	.98 pts.	.70 pts.

Option Premium Quotations

Closing prices for CME options products are found in many business publications, such as *The Wall Street Journal*. If you have mastered the vocabulary and concepts up to this point, locating various options with differing strike prices and expiration months should be easy.

For example, notice the shaded areas in the following Euro FX options table, showing the premium quotes on a Euro FX September 87 call option. The premium is quoted at .54 cents/euro. In other words, the buyer of this option has the right, but not the obligation, to go long Euro FX futures at 87 any time before expiration. The buyer of this call will pay $675.00 (.54 cents/euro x 125,000 euro = $675.00) to the seller.

EURO FX (IMM) – 125,000 Euros

Strike Price	Calls-Settle Jun-c	Calls-Settle Sep-c	Calls-Settle Dec-c	Puts-Settle Jun-p	Puts-Settle Sep-p	Puts-Settle Dec-p
82	2.00	2.81	3.31	0.06	0.65	0.96
83	1.17	2.12	2.69	0.23	0.95	1.30
84	0.53	1.57	2.15	0.59	1.38	1.72
85	0.19	1.12	1.69	1.25	1.90	2.22
86	0.05	0.79	1.31	2.11	2.56	2.60
87	0.02	0.54	1.01	3.08	3.29	3.46

Est. vol. 13,020, Wed. vol. 6,007 calls, 4,526 puts
Open interest Wed.: 73,689 calls, 70,024 puts

1 Most active strike prices

2 Expiration month

3 Closing prices for call options

4 Closing prices for put options

5 Volume of options transacted in the previous two trading sessions. Each unit represents both the buyer *and* the seller

6 The number of open short or long option positions at the end of the previous day's trading session.

In the Swiss Franc option quote table, again notice the shaded areas. They represent the settlement price of a Swiss Franc September 60 put option, .99. This would give the put buyer the right to sell September Swiss Franc futures at 60 anytime between purchase and expiration. The buyer would pay $1,237.50 (.99 cents/ franc x 125,000 francs = $1,237.50) to the seller.

SWISS FRANC (IMM) 125,000 francs; cents per franc

Strike Price	Calls-Settle Jun-c	Calls-Settle Jul-c	Calls-Settle Dec-c	Puts-Settle Jun-p	Puts-Settle Jul-c	Puts-Settle Sep-p
60	2.02	2.22	2.69	0.21	0.50	0.99
61	1.28	1.58	2.10	0.46	0.85	1.38
62	0.73	1.06	1.59	0.91	1.32	1.85
63	0.38	0.68	1.21	1.56	1.92	–
64	0.18	0.42	0.88	–	–	–
65	0.09	0.24	0.63	–	–	–

Est. vol. 1,976, Fri. vol. 2,480 calls, 4,459 puts
Open interest Fri.: 15,989 calls, 24,450 puts

3. The Arithmetic of Options

Breakeven Points

As mentioned previously, options are versatile instruments that allow the trader to capitalize on a market opinion while limiting risk to a predetermined amount. The maximum amount the option buyer can lose is the premium that he originally paid, plus his brokerage commissions. But before initiating an options position he should first calculate his breakeven point. To calculate an options breakeven point the trader uses the strike price and the premium. Knowing breakeven points will help traders choose more effective strategies.

Example: *A trader purchases a June S&P 500 1150 call option and pays a premium of 7.50. Where does the underlying futures have to advance for the option to break even at expiration?*

Breakeven point for calls:

Strike Price	+	Premium Paid	=	Breakeven Point
1150	+	7.50	=	1157.50

Thus, for this position to break even, the underlying June futures has to advance to 1157.50.

Example: *If a trader purchases a September Swiss Franc 60 put option for .75 pts., how far must the June Swiss Franc future decline for his option to break even at expiration?*

Breakeven point for puts:

Strike Price	–	Premium Paid	=	Breakeven Point
60	–	.75	=	59.25 (or .5925)

*Commissions should also be factored into this equation, but differ from firm to firm. Discuss the effects of commissions on breakeven points with your broker.

Time Value and Intrinsic Value

The underlying futures price level compared with the exercise price and the passage of time both have an impact on options premiums. Two terms that describe these effects are referred to as *time value* and *intrinsic value*. An option's premium comprises both. Calculating these two values requires only the strike price, the underlying futures price and the option premium.

Intrinsic value and time value for calls:
In the case of a call, intrinsic value is the amount by which the underlying futures price exceeds the strike price:

Futures Price – Strike Price = Intrinsic Value (must be positive or 0)

Example: *June Live Cattle futures are trading at 72.50 cents/lb. and the June 70 Live Cattle call option is trading at 3.50 cents/lb. What are the time value and intrinsic value components of the premium?*

Futures Price	–	Strike Price	=	Intrinsic Value
72.50	–	70.00	=	2.50

Time value represents the amount option traders are willing to pay over intrinsic value, given the amount of time left to expiration for the futures to advance in the case of calls, or decline in the case of puts.

Options Premium	–	Intrinsic Value	=	Time Value
3.50	–	2.50	=	1.00

Time Value	+	Intrinsic Value	=	Premium
1.00	+	2.50	=	3.50

Intrinsic value and time value for puts:
In the case of a put, intrinsic value is the amount by which the underlying futures price is below the strike price:

Strike Price – Futures Price = Intrinsic Value (must be positive or 0)
Put Option Premium – Intrinsic Value = Time Value
Put Time Value + Put Intrinsic Value = Put Option Premium

Example: *What are the time value and intrinsic value of a Eurodollar 95.00 put if the underlying futures are trading at 95.00 and the option premium is .25?*

Strike Price	–	Futures Price	=	Intrinsic Value
95.00	–	95.00	=	0

There is no intrinsic value.

Options Premium	–	Intrinsic Value	=	Time Value
.25	–	.00	=	25

The entire premium is made up of time value.

4. Additional Terminology

In-the-money

A call option is said to be in-the-money when the futures price exceeds the option's strike price. A put is in-the-money when the futures price is below the option's strike price. For example, a September Canadian Dollar 60 call option will be in-the-money if September Canadian Dollar futures are above 60, meaning that the holder has the right to buy these futures at 60, regardless of how much the price has risen. Any option that has intrinsic value is in-the-money.

At-the-money

An option is at-the-money when the futures price equals the option's strike price. A December S&P 500 call option with a strike price of 1100 is at-the-money if the December S&P 500 futures contract is trading at 1100.00.

Out-of-the-money

When the futures price is below the strike price (for calls) and above the strike price (for puts) the option is said to be out-of-the-money. An option that has no intrinsic value, but only time value, is out-of-the-money. If Eurodollars are trading at 94.00, a 94.50 call would be out-of-the-money.

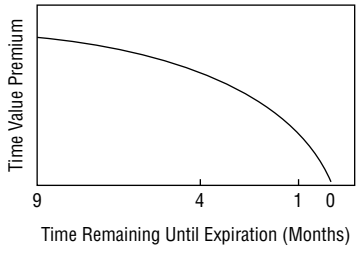
Delta

Delta measures the rate of change of an option premium with respect to a price change in the underlying futures contract. Delta is a measure of price sensitivity at any given moment. Not all options move point-for-point with their underlying futures contracts. If a futures contract moves .50 points and the option only moves .25 points, its delta is 50%; i.e., the option is only 50% as sensitive to the movement of underlying futures contract.

The delta will change as an option moves from out-of-the-money to at-the-money to in-the-money, approaching 100%. Deltas range from 0% to 100%. The delta of the underlying futures contract is 100% (options pricing software is normally used to calculate delta).

Time Value Decay

As discussed in the previous section, the value of an option beyond intrinsic value is called time value. It is the sum of money option traders are willing to pay given the likelihood of the option increasing in value. Time value erodes as each day passes, accelerating as expiration nears. This characteristic of options is referred to as time-decay and is the reason why options are sometimes considered "wasting assets." If time passes and the underlying futures contract does not move far enough by expiration, the option's time value will decay and the option trader may incur a loss. The graph below illustrates the principle of time decay and its acceleration as expiration draws near.



Performance Bond

An option buyer must only put up the amount of the premium, in full, at the time of the trade. However, because option selling involves more risk, an option seller or writer will be required to post performance bond. Your broker can discuss the performance bond requirement associated with selling options (see section regarding risks in selling options). Once an options position is exercised into a futures position, performance bond is required, just as for any other futures position.

5. Basic Strategies

There are literally dozens of options strategies that a trader can employ to take advantage of a particular opinion and market environment. The examples that follow merely suggest what you can do given the flexibility of options, not what you should do.

Example: *Buying calls to take advantage of a rising stock market*

S&P 500 STOCK INDEX (CME) $250 times premium

Strike Price	Calls-Settle May-c	Jun-c	Sep-c	Puts-Settle May-p	Jun-c	Sep-p
1145	11.80	14.40	24.20	0.30	3.00	8.20
1150	7.30	10.60	20.50	0.80	4.10	9.40
1155	3.40	7.30	17.10	1.80	5.80	10.80
1160	1.20	4.60	14.00	4.70	8.10	12.60
1165	0.20	2.70	11.20	–	11.10	–
1170	0.10	1.50	8.70	–	14.90	17.00

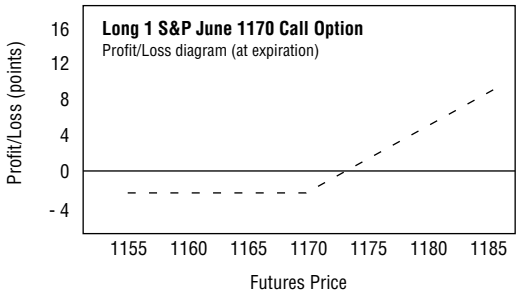
Est. vol. 11,631: Mon. vol. 5,373 calls; 7,170 puts
Open interest Mon; 79,531 calls; 150,715 puts

Outlook:	Significant advance in the stock market
Futures price:	June S&P 500 Stock Index futures @ 1156.50
Strategy:	Buy 1 June 1170 S&P 500 call option @ 1.50 pts. (1.50 pts. x $250/pt. = $375.00)
Breakeven point:	1171.50 (strike + premium or 1170 + 1.50)
Risk:	Limited to premium paid: 1.50 pts./call ($375.00)

Profit/Loss at expiration:

Futures price	1170 call price	profit/loss
1155.00	0.00	–1.50 pts (375.00)
1160.00	0.00	–1.50 pts (375.00)
1165.00	0.00	–1.50 pts (375.00)
1170.00	0.00	–1.50 pts (375.00)
1175.00	5.00	+3.50 pts (875.00)
1180.00	10.00	+8.50 pts (2125.00)
1185.00	15.00	+13.50 pts (3375.00)

As the profit/loss table above and the graph on p. 19 demonstrate, buying calls can result in significant profits should the S&P 500 futures rally. More importantly though, the trader's risk is limited to 1.50 points no matter how far the S&P 500 futures may decline.



Example: *Buying put options to profit from declining live cattle prices*

Cattle-Live (CME) 40,000 lbs.; cents per lb.

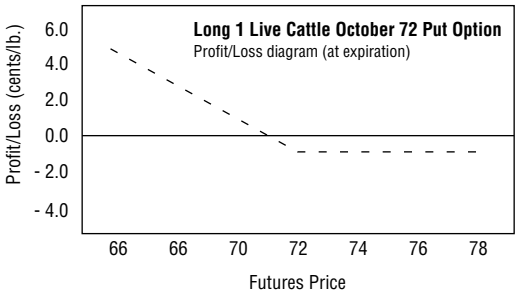
Strike Price	Calls-Settle Jun-c	Aug-c	Oct-c	Puts-Settle Jun-p	Aug-c	Oct-p
70	3.72	2.92	5.02	0.02	0.55	0.52
72	1.87	1.57	3.45	0.17	1.17	0.90
74	0.47	0.72	2.10	0.77	2.27	1.50
76	0.10	0.27	1.15	2.40	–	2.50
78	0.00	0.10	0.55	–	–	–
80	0.00	–	0.22	–	–	

Est.vol. 2,577, Mon. vol. 483 calls, 547 puts
Open interest Mon.; 26,617 calls, 35,197 puts

Outlook:	A speculator thinks cattle prices will retreat from recent highs. He wants to avoid the unlimited risk associated with selling futures short.
Futures price:	October Live Cattle futures @74.60
Strategy:	Purchase October 72 Live Cattle put option @.90 (actual dollar amount: .90 cents/lb. x 40,000 lbs. = $360.00)
Breakeven point:	71.10 cents/lb. (strike price – premium)
Risk:	Limited to premium paid: .90 cents/lb. or $360.00

Profit/Loss at expiration:

Futures price	72 put price	profit/loss
66.00	6.00	+5.10 (2040.00)
68.00	4.00	+3.10 (1240.00)
70.00	2.00	+1.10 (440.00)
72.00	0.00	-.90 (360.00)
74.00	0.00	-.90 (360.00)
76.00	0.00	-.90 (360.00)



Futures Price

The table on p. 19 and the graph above again demonstrate one of the prime advantages of buying options. If the trader were wrong and Live Cattle futures advanced sharply, his risk would be limited to the .90 cents/lb. premium he paid. And, if his analysis were correct, he could realize substantial profits on a relatively small investment.

A Word About Selling Options

This booklet has emphasized the advantages of a limited risk investment involved in purchasing options. As discussed earlier, if someone buys an option, there must be a seller on the other side of the trade. While selling options can also be a profitable strategy, it must be stressed that it is a strategy that entails substantially more risk than buying options. An individual who sells options has the potential to lose large sums of money. The strategy should therefore only be initiated by individuals who fully know the extent of the risks involved and can meet the financial requirements.

6. Review Questions

(more than one answer may be correct)

1. Which of the following best describes options on futures?

A the right to buy or sell a futures contract
B the right to take delivery of a cash commodity
C the right to assign a futures contract

2. A put option is:

A the other side of a call option position
B the right to buy a futures contract
C the right to sell a futures contract

3. A call option is:

A the other side of a put option transaction
B the same as a short futures position
C the right to go long a futures contract

4. Options on futures are:

A usually offset before expiration
B wasting assets
C traded on regulated commodity exchanges such as CME

5. The premium of an option is:

A set by the exchange staff
B unaffected by futures prices
C determined by buyers and sellers reflecting supply and demand

6. The exercise price is:

A the number of days remaining in the life of an option
B the number of contracts you can exercise
C the price at which the option holder may go long (calls) or short (puts) the underlying futures

7. The different strike prices are set by:

A option sellers
B option buyers
C the Exchange

8. Intrinsic value for call options is calculated by:

A futures price minus the exercise price
B exercise price minus the futures price
C futures price minus the call premium

9. The breakeven point for a call option purchase is:

A strike price plus days to expiration
B futures price plus the call option premium
C strike price plus the call option premium

10. Options can be used by:

A speculators desiring to profit from a market move with limited risk
B hedgers wishing to protect themselves against adverse price moves
C anyone knowledgeable in finance

11. Sellers of options:

A should be aware of the risks involved with selling options
B can lose large sums of their trading capital
C must meet performance bond requirements

12. To take advantage of a rising market one could:

A sell call options
B buy call options
C sell futures contracts

13. If a trader pays 4.00 pts. for an option on the S&P 500 futures the most he could lose is:

A 4.00 pts.
B 8.00 pts.
C losses could be unlimited

14. A speculator is considering the purchase of a put option. He will:

A pay the entire premium up front
B put up performance bond funds
C profit if the market advances on him

15. Chicago Mercantile Exchange offers options on:

A equity products
B foreign currency products
C livestock products
D interest rate products

16. If one exercises a call option on a futures contract, the resulting position will be:

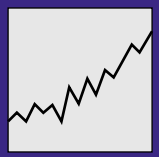
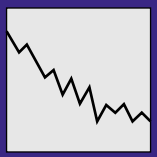
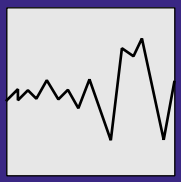
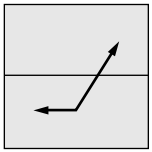
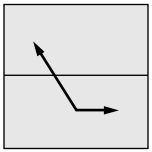
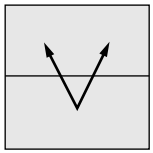
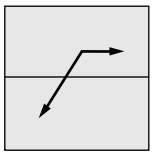
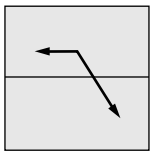
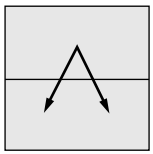
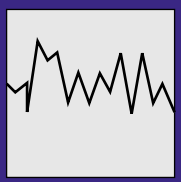
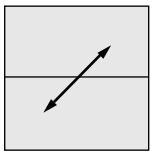
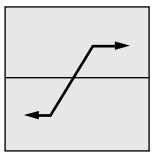
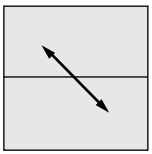
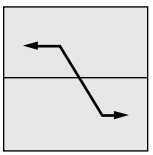
A a long futures
B a short futures
C a neutral position

Answers to review questions:

1. **A**
2. **C**
3. **C**
4. **A, B, C**
5. **C**
6. **C**
7. **C**
8. **A**
9. **C**
10. **A, B**
11. **A, B, C**
12. **B**
13. **A**
14. **A**
15. **A, B, C, D**
16. **A**

Basic Option Strategies

Initiating a Market Position

	BULLISH 	BEARISH 	UNDECIDED 
VOLATILITY RISING 	**LONG CALL**  Buy a call	**LONG PUT**  Buy a put	**LONG STRADDLE**  Buy a call and buy a put at same strike
VOLATILITY FALLING 	**SHORT PUT**  Sell a put	**SHORT CALL**  Sell a call	**SHORT STRADDLE**  Sell a call and sell a put at same strike
VOLATILITY UNDECIDED 	**LONG FUTURES**  Buy a futures **BULL SPREAD**  Buy a call and sell a call at a higher strike /or/ Buy a put and sell a put at a higher strike	**SHORT FUTURES**  Sell a futures **BEAR SPREAD**  Buy a put and sell a put at a lower strike /or/ Buy a call and sell a call at a lower strike	

Sources of Additional Information

For more information about options and the important opportunities they provide, contact your broker. Together, you can determine what role options should play in your investment strategy.

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