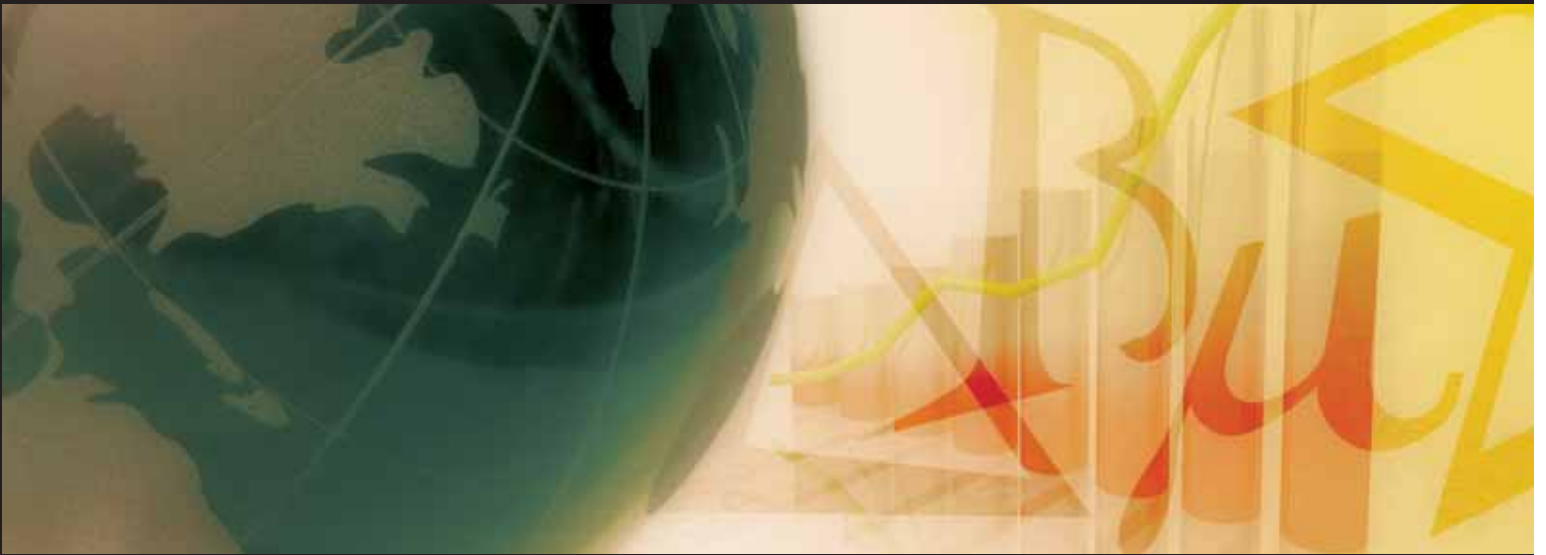


# OPTIONS COMPLEX



OVERVIEW  
STRATEGIES  
GLOSSARY



VISION IS OUR GREATEST COMMODITY™



## OVERVIEW

Options contracts are exactly what the name says: market participants who hold options have the right, but not the obligation, to buy or sell the underlying futures contract.

Options are extremely versatile financial instruments that often drive sophisticated hedging strategies. Even though modern commodity futures markets have been trading in the United States for more than 150 years, a reliable method of options pricing was not developed until 1973 and the first exchange-traded commodity options were not listed until 1982.

Today, options on futures play a vital role in risk management and investment strategies. The varied slate of energy and metals options contracts listed on the New York Mercantile Exchange, Inc. provides a versatile complement to the futures contracts that serve as pricing benchmarks in the underlying commodities: light sweet crude oil, heating oil, gasoline, natural gas, electricity, gold, silver, platinum, palladium, copper, and aluminum. Specialized options are also available on energy crack spreads (the price differential between crude oil and refined products), calendar spreads (the differential between different contract months of the same commodity), and energy options contracts and those for crude oil and natural gas inventory levels that are transacted off of the Exchange and are available only for clearing.

The global nature of the energy and metals markets makes their prices subject to extreme volatility. Market participants can mitigate price uncertainty by actively hedging against adverse price movements with futures and options contracts.

While futures are among the primary price risk management tools, options on futures provide the ability to hedge cash and futures positions against an adverse price direction without foregoing the benefits of favorable price movements.

Options provide a means for commercial market participants investors to act aggressively or conservatively, depending on their views about the direction and volatility of the underlying markets.

By using options alone, or in combination with futures contracts, strategies can be found to cover virtually any risk profile, time horizon, or cost consideration.

### **CLEARING FOR ALL TRANSACTIONS OFFERS FINANCIAL PROTECTION**

All transactions on the Exchange are processed through its clearinghouse which mitigates counterparty credit risk by ultimately acting as the buyer to every seller and the seller to every buyer. Transactions are backed by an extensive financial safety net including a guarantee fund of approximately \$200 million and a \$115 million default insurance policy. For the last several years, NYMEX Holdings, Inc., the parent company of the Exchange, has received and maintained an AA+ long term counterparty credit rating from Standard and Poor's. A list of the Exchange clearing members can be found on its website, [www.nymex.com](http://www.nymex.com).

## WHAT IS A FUTURES CONTRACT?

To understand options, it is necessary to first be familiar with futures contracts, the underlying instruments.

A futures contract is a binding agreement between a buyer and a seller for delivery of a particular quantity of a commodity at a specified time, place, and price. Futures are used as a proxy for cash transactions before actual purchases or sales take place. This agreement allows the buyer to assess his costs in advance of purchase and the seller to value his inventory in advance of sale.

The price of a futures contract is a distillation of the price expectations of market participants worldwide who each view the supply, demand, and other market factors from their own unique perspective. As a result, all traders have equal opportunity to achieve the market price.

The futures market is used for price protection by commercial interests all along the supply and distribution chain from producers to end-users. Speculators seek to profit by assuming the risk that commercial participants want to avoid, and, in doing so, add liquidity to the market. In hedging, futures contracts are sold to reduce the risk of price declines, and are bought to reduce

the risk of price increases. An oil producer or gold mining company, for example, can sell a crude oil or gold futures contract to lock in a sales price, thereby protecting against a price decline. An oil refiner or metals fabricator can buy a futures contract to lock in a purchase price for raw materials, thus protecting against an increase in those costs.

## WHAT ARE OPTIONS?

An options contract essentially works like an insurance policy. A homeowner wishing to protect against a risk pays an up-front premium. If the risk occurs, he is reimbursed. If the risk does not occur, he is out nothing but his premium. The buyer of the insurance policy assumes no obligations. The insurance company that writes the policy has the obligation to pay if a claim is filed against the insurance policy.

Likewise, the holder of an options contract pays a one-time premium (the price of the option) for the right but not the obligation to buy or sell a futures contract at a specific price within a specific period of time. The seller, or writer, of an options contract has an obligation to sell or buy the underlying futures contract if called upon to do so.

## OPTIONS COVER ALL SIDES OF THE MARKET

There are two types of options: calls and puts. A call gives the holder of the option the right, but not the obligation, to buy the underlying futures contract. Conversely, a put gives the holder the right, but not the obligation, to sell the underlying futures contract.

The price at which the underlying futures contract may be bought or sold is the exercise price, also called the strike price. An option grants the right to buy or sell for only a limited period of time; each option has an expiration date.

On the opposite side, a writer of an option receives a payment – the premium – from the buyer. In return for the premium, the writer of the option incurs an obligation. The writer of a call is obligated to sell a futures contract and the writer of a put has an obligation to buy a futures contract if the holder of the option chooses to exercise it.

Trading on the Exchange is done with anonymous counterparties and, when an option is exercised, the Exchange clearinghouse randomly assigns an options writer to fulfill the obligation.

An option is a wasting asset. It has an initial value that declines with the passage of time. Depending upon

the movement of an options price, the holder of an option will choose one of three alternatives for terminating an options position:

- Exercise the options contract by buying or selling the underlying futures contract.
- Liquidate the options contract by selling it back into the market.
- Let the options contract expire.

Liquidation is the most common choice. A small percentage of options holders exercise their options, particularly if their strategy calls for acquiring a long or short futures position at the strike price.

If the futures price does not move far enough for an exercise to be worthwhile, or moves in the opposite direction, buyers can simply let their options contract expire valueless.

The ability to trade in and out of positions is the great advantage of standardized options contracts.

Options pricing is affected by four major factors:

- The price of the underlying futures contract relative to the strike price of the option.
- The volatility of underlying futures price.
- The time remaining before expiration.
- Interest rates.

Volatility measures the market's movement within a price range; direction of the range is irrelevant. There are three types of volatility:

Historical volatility is calculated by taking a mathematical measurement of the underlying futures contract and extrapolating what volatility should be worth according to moves in the underlying commodity. Just as a moving average can be calculated for the futures contract over a five-, 10-, or 15-day period, the same can be done for historical volatility — the standard deviation of the changes of the underlying futures contract for a specific historical time frame. It is always a good idea to keep in mind that historical volatility and real volatility, also called implied volatility, can vary greatly from one another. Past indicators of any type do not necessarily indicate future performance.

Implied volatility is the actual volatility trading in the marketplace. When one trades an option and then

hedges that option using the futures-equivalent component of an options valuation also known as “delta,” the trader locks in a definitive volatility price. The delta is the amount, in percent, by which an option premium will change relative to a change in the underlying futures price. Deltas are positive for bullish options positions and negative for bearish options positions.

This “known” price and hedge equates to a volatility price. Implied volatility moves in much the same way that futures markets move, subject to supply and demand. As volatility increases, so does the value of options, all else remaining equal. For example, with other factors remaining equal, the premium for at-the-money \$590 gold calls with 90 days to expiration will increase dramatically with incremental increases in volatility. The volatility profile of crude oil is considerably different, such as in the example for a \$65 crude oil call with 90 days to

GOLD	DAYS OUT	INTEREST	STRIKE PRICE	VOLATILITY	FUTURES	PREMIUM
	90	3.00%	590.00	8.00%	590.00	\$9.28
			590.00	10.50%	590.00	\$14.52
			590.00	13.00%	590.00	\$17.41
			590.00	15.50%	590.00	\$20.30
			590.00	18.00%	590.00	\$23.20
			590.00	20.50%	590.00	\$26.10
			590.00	23.00%	590.00	\$29.00

CRUDE OIL	DAYS OUT	INTEREST	STRIKE PRICE	VOLATILITY	FUTURES	PREMIUM
	90	3.00%	65.00	20.00%	65.00	\$2.56
			65.00	22.50%	65.00	\$2.87
			65.00	25.00%	65.00	\$3.19
			65.00	27.50%	65.00	\$3.51
			65.00	30.00%	65.00	\$3.83
			65.00	32.50%	65.00	\$4.15
			65.00	35.00%	65.00	\$4.47

expiration: Theoretical volatility is the “assumed” volatility value of options used by traders to trade options. Traders enter estimated values for options using a volatility program that then, in turn; extrapolate premium values for the strike prices that they trade. Traders of options constantly change their assumptions of volatility to reflect current market conditions.

### STRIKE PRICE VS. FUTURES PRICE

Depending upon where futures prices lie relative to a given strike price, an option is said to be at-the-money, in-the-money, or out-of-the-money.

An option is at-the-money when the strike price is the closest to the price of the underlying futures contract. For example, if the November crude oil futures price is \$50 per barrel, the November \$50 call and the November \$50 put are the at-the-money-options.

An option is considered in-the-money when the price of the futures contract is above the strike price of a call, or when the futures price is below the strike price of a put.

When the October heating oil futures price is \$1.7500 per gallon, the October 1.72 call option is in-the-money. That contract grants the holder the right to buy an October futures contract at \$1.7200 per gallon even though the market is at \$1.7500. Therefore, the call is automatically worth at least \$0.03 per gallon; and is said to have an intrinsic value of \$0.03.

A put is in-the-money when the underlying futures price is less than the strike price. If the September gold futures contract is \$520 per ounce, a September 535 put is in-the-money. It gives the holder of the option the right to sell a gold futures contract at a price of \$535 even though the market is trading at \$520, giving the option an intrinsic value of 15.

When the December natural gas futures price is \$6.50 per million British thermal units (Btus), the December \$6.65 call is out-of-the-money. The call option grants the holder of the options contract the right to buy a December futures contract at \$6.65 per million Btus even though the market is at \$6.50. Therefore, the call has no intrinsic value.

A put is out-of-the-money when the underlying futures price is higher than the put's strike price. If the March copper futures contract is 210.00 cents per pound, a March 200 put is out-of-the-money. The options contract gives the holder the right to sell a futures contract at a price of 200.00 cents per pound, but since the market is trading at 210.00 cents, it is unlikely the options contract would be exercised.

The premium of an option will usually equal or exceed the intrinsic value of the option. If a crude oil options contract, for example, is in-the-money by \$1 per barrel, its premium will almost always be at least \$1.

At least 61 strike prices are listed at all times for the light sweet crude oil options contract. The first 20 strike prices on either side of the at-the-money strike are in increments of \$0.50 per barrel; the next 10 strike prices are in increments of \$2.50 above the nearest higher and below the nearest lower existing strike prices. The at-the-money strike price is nearest to the previous day's close of the underlying futures contract.

Strike price boundaries are adjusted according to the futures price movements. Once listed, all strike prices are offered until expiration of the contract.

For the strike price intervals of other options contracts, go to the Exchange website at [www.nymex.com](http://www.nymex.com)

## OPTIONS VARIABLES – THE GREEKS

Changes in the underlying futures, volatility, the time remaining before expiration, and interest rates all have an impact on the price of an option. Some factors are more prone to change than others. The change in the time to expiration is the only one that is predictable. Interest rates may change radically, or not at all. Futures prices and volatility could be on a roller coaster day after day. It is important for an options trader to understand the propensity of each to change, and the unique role each plays in options pricing.

The dynamics of how the price of an options contract changes over time prior to expiration are often thought of as how different variables change, all other variables being constant. The variables affecting options pricing include the underlying futures price, the exercise price, the volatility of the underlying futures, time, and interest rates and are referred to as the Greeks. While the exercise price is set by the Exchange for the life of the options contract, the other variables change over this period. How these parameters affect options value prior to expiration becomes extremely important for both hedgers and speculators.



**DELTA** – The delta of an options contract represents the approximate change in its value as the underlying futures price changes by a small amount. Mathematically, the delta represents the partial derivative of the change in options value with respect to the futures price. In virtually every case, the options contract will change by a fraction of the underlying futures price. Deltas range from zero to one for call options, and zero to minus one for put options.

For example, an at-the-money call options contract has an exercise price approximately equal to the current futures price. In that case, the delta of the options contract would be approximately 0.5, or -0.5 for the put options contract. This means that the value of the options contract can be expected to change by about one-half of the change in the underlying futures contract. If light sweet crude oil futures were to change by \$0.50, the price of the at-the-money option would change by approximately \$0.25.

For out-of-the-money options, delta falls from 0.5 towards zero, depending upon how much the options contract is out-of-the-money. For call options, this occurs when the exercise price is above the current futures price. The opposite holds true for puts. In-the-money options have deltas which begin to approach one or minus one. For call options, this occurs when

the exercise price is below the underlying futures; for put options, the strike price is above the underlying futures price.

For example, if December light sweet crude oil futures are currently trading at approximately \$55.00, the value of a December crude oil call option with a strike price of \$54.50, a time to expiration of 30 days, and a volatility of 25%, would have a delta of about 0.62. In other words, if the futures change by \$1.00, the call option should change by approximately \$0.65.

These general tendencies notwithstanding, the delta will tend to go to either zero or one as the options contract approaches expiration. This is particularly true for options with only a day or two until expiration, which is why the delta is sometimes interpreted as measuring the probability of the options contract expiring in-the-money.

An important application of delta is that it can be used for determining a hedge ratio for options positions. The hedge ratio is an estimate of how many options are needed to offset the price risk from holding a single futures position. The hedge ratio is obtained by taking the reciprocal of the delta. For example, if the delta is 0.5, it would take two such options to offset the price risk of a futures position.

**GAMMA** – The delta of an option represents the change in options contract value as the underlying futures contract changes by a small amount. The gamma, on the other hand, represents the change in the delta as the underlying futures contract changes. The gamma is greatest – that is, the delta changes the most – when the options contract is at-the-money. As the options contract goes out-of-the-money, and the delta goes to zero, the gamma also goes to zero. The same is true when the options contract moves to an in-the-money position and the delta goes to one. The gamma measures the variability of the delta.

Consequently, the gamma is a measure of the risk of the hedge ratio. As the delta changes, so does the hedge ratio. The gamma gives the options hedger a tool with which to gauge the sensitivity of the hedge as it relates to changes in the underlying futures price.

For example, an in-the-money crude oil options contract with a \$54.50 strike price and 30 days to expiration might have a gamma of 0.21. This means that for a \$0.10 change in crude oil futures prices, the delta might change by 0.21.

**VEGA** – Options contracts derive much of their value from the anticipated volatility in the underlying futures market. The sensitivity of options value to changes in the underlying volatility is known as the vega of the

options contract. Options volatility is directly related to the premium. This can seem counterintuitive, since in most asset markets higher volatility typically results in lower prices. However, the asymmetric nature of options returns cause the opposite reaction for option prices. Specifically, buyers of options have a loss potential limited to the amount of the premium. Their potential gains, however, are potentially unlimited. Volatility enhances the value of an options contract.

Unlike delta and gamma, vega tends to be significant regardless of where the strike price is relative to the underlying futures price. Volatility risk is difficult to hedge with futures contracts, and generally option traders must use other option positions to hedge the volatility risk of a particular market.

Volatility historically has fluctuated widely in energy options. For example, since 1990, the implied volatility on crude oil options has ranged from about 10% to more than 100%. Unstable periods such as in 1991, 2001, and 2004 through 2006 tend to lead to heightened volatility levels. When world tensions or inflation increases these volatilities can rise substantially.

**THETA** – As time elapses, the effect on option value varies depending on the length of time to expiration. This is known as theta, or time decay. In order to understand theta, it is helpful to divide the option

premium into its two principal components: time value and intrinsic value. This time value diminishes as expiration approaches. It is important to understand that theta is not a constant. When an options contract is far from expiration, such as more than 30 days, the passage of time has a minimal impact on value. However, as expiration approaches, the time decay begins to accelerate. At the extreme, on expiration day, the options contract will lose 100% of its time value.

**RHO** – Options on futures are somewhat sensitive to changes in interest rates. Unlike options on stocks, which tend to increase in value as interest rates rise, futures options have an inverse relationship to changes in the time value of money. The reason for this is that equity options derive their value from their leverage. The higher the interest rate, the higher the value of leverage and, hence, the higher the options value. Alternatively, since the options writer would have to finance a hedge in the stock market, in an arbitrage-free environment he would seek to be compensated with a higher options premium. Options on futures contracts do not derive their value from leverage since the cost of carrying futures contracts is minimal as margin requirements are typically met with interest bearing U.S. Treasury notes. Therefore, the higher the interest rate, the lower the value of the option. Overall, however, this is not a particularly strong relationship. It generally takes a very high interest with a relatively long time to expiration to have a significant impact on the value of commodity options.



## STRATEGIES

## **SELECTING AN OPTIONS STRATEGY**

Options strategies can be tailored to provide varying degrees of protection and opportunities for profit in most market environments. For example, if an out-of-the-money option is chosen for hedging programs, protection will be low in cost but not as extensive as the protection provided by programs using an in- or at-the-money option. In order to be exercised, an out-of-the-money option requires the greatest difference in the price of the underlying future.

Consequently, there is less risk to the options seller. The distance between the strike price of the options contract and the value of the underlying futures contract can be viewed as the equivalent of an insurance deductible. In return for the higher premium paid for the in- and at-the-money options, the deductible is reduced and protection is immediate beyond the cost of the option. In fact, the in-the-money options contract will behave similarly to the underlying futures contract.

### **THE LONG SIDE**

Buying calls, also known as “going long,” is a basic hedging strategy used to protect against rising prices. Similarly, buying puts will protect against falling prices.

Strategies based on buying options are most effective when sharp moves are expected, or unlimited margin risk cannot be tolerated by the trader. Hedging costs are limited to the premium, so the hedger retains his ability to participate in favorable price movements.

### **THE SHORT SIDE**

A trader or hedger can also profit from selling options. Just as purchasing options is similar to buying insurance, selling options resembles the function of the underwriter. The options writer collects the premium and is obligated to perform should the buyer exercise his option. If the buyer does not exercise, the seller retains the premium. Because the options writer incurs a risk that is potentially unlimited, short strategies that are not hedged are appropriate only for those willing and capable of assuming substantial risk.

If a trader believes the price of futures will remain stable or fall slightly, he could sell a call. Or, if he thinks the prices will remain stable or rise slightly, he could sell a put. If he thinks the market will be quiet and relatively stable, he could sell a straddle, a combination of a short call and a short put.

As long as the buyer has no incentive to exercise his option, the writer profits.

For commercial users, selling options helps offset inventory carrying costs by generating premium income. By accepting the premium, the trader augments his current income and has downside protection equal to the premium. However, he gives up the ability to participate in favorable price moves, should they occur.

While futures offer price protection by allowing the holder of a futures contract to lock in a price level, a major appeal of options is that the holder of an option is afforded price protection, but still has the ability to participate in favorable market moves. Because the buyer of an option assumes no market obligation, he incurs no expenses beyond the initial premium. If the market moves against his position, the maximum cost is the price that he has already paid for the option.

On the other hand, if the market moves in favor of a position, the virtually unlimited profit potential to the buyer of an option is parallel to a futures position, net of the premium paid for the option. Therefore, protection from unfavorable market moves is achieved at a known cost, without giving up the ability to participate in favorable market moves.

For example, an oil refiner buying crude oil is exposed to the risk of rising crude prices, and benefits from declining raw material prices. The less costly the crude, the lower his manufacturing costs will be. In order to protect against crude oil cost increases, the refiner can

either buy a crude oil futures contract or buy a crude oil call options contract.

Assume that the crude market is trading at \$54 a barrel, but the refiner fears that prices may increase in the next quarter. He could buy \$54 call options for each of the three months involved for \$0.40 a barrel, or \$400 per contract (each contract is for 1,000 barrels), plus transaction costs.

If the price climbs to \$57 per barrel, the refiner has earned \$3,000 per contract (\$3 per barrel on 1,000 barrels), less the \$400 premium he paid for the call, for a net gain of \$2,600. This gain would offset \$2.60 of the \$3-a-barrel increase in his cash crude costs.

What if crude oil prices fall? Because the holder of an options contract has a right and not an obligation, if the price of crude oil falls to \$52 per barrel, the refiner would let the options contract expire and buy his crude oil requirements in the cash market at the lower, more favorable market price.

In comparison, assume that the refiner hedges his position only with futures. He buys crude oil futures at \$54 and the market rises to \$57. In that case, his profit on the futures position would be \$3,000 or \$3 per barrel, which would offset the increase in his cash crude costs. However, if the price falls to \$52 per barrel, the refiner would have locked in his cost at \$54 per barrel and forfeited the lower, more favorable market price. The futures-only position gives him

a stable oil acquisition cost of \$54 no matter which way prices move, at the cost of forfeiting the ability to take advantage of a decline in raw material prices.

## **INVESTORS CAN USE OPTIONS**

While investors purchase options to accomplish a wide array of investment objectives, investors write options to earn premium income.

The options writer receives the premium in exchange for assuming the obligation to transfer an underlying futures contract at the strike price should the buyer exercise the option.

Since purchasers of Exchange options have unlimited profit potential with limited loss potential, the options writer must assume the other side of the risk/reward equation — limited income and unlimited price risk. For this reason, it is common for the options writer to sell calls during periods of flat to slightly bearish markets, and to sell puts in neutral to mildly bullish markets. In the event that futures prices move against the options writer, the loss is reduced somewhat by the premium collected.

Warehouse receipts for physical gold, silver, copper, and aluminum are widely accepted as collateral for the financing of margin calls against a short call position in the metals options markets. Those

commercial firms who own metals can write calls without the worry of having to come up with cash in the face of increasing metals prices.

By writing calls and collecting premiums, a merchant can obtain a limited degree of price protection in the event of a price decline. Should metals prices increase, the merchant will effectively sell his physical inventory for a higher price (the strike price of the options plus the premium received) than he would have obtained through a hedge in the futures market.

## **SPECIALTY OPTIONS CONTRACTS**

Straightforward options contracts that are derived directly from the underlying futures contracts are often referred to as “plain vanilla” options. Sometimes, however, more sophisticated instruments are needed, and a series of specialty options contracts has evolved that are tailored to meet specific hedging requirements.

## **CRACK SPREAD OPTIONS**

A common oil hedging strategy involves the “crack spread,” the price differential between the futures contract for a refined product — heating oil or gasoline — and crude oil.

The crack spread options contracts were the first exchange-traded options contracts to be based on

inter-market spreads. Two crack spread options are listed, one on the price spread between New York Harbor gasoline and light sweet crude oil futures, the other on the heating oil/crude oil futures price spread. Crack spread options are American-style options that can be exercised into the underlying futures contracts at any time.

The crack spread options trade with a one-to-one ratio of crude oil to the product. They differ from conventional options in that a single options position results in two futures positions when the options contract is exercised.

Crack spread options are standardized Exchange instruments. They allow the hedge to be accomplished with the payment of one options premium instead of two. Crack spread options also offer the inherent advantages of outright options on futures which allow market participants with commercial exposure to hedge their price risk without giving up the ability to participate in favorable market moves.

When a crack spread call is exercised, the writer of the options contract is obligated to sell to the holder of the option a gasoline or heating oil futures contract and purchase a crude oil futures contract for the price differential as represented by the strike price.

Conversely, when a crack spread put is exercised, the writer is obligated to purchase a gasoline or heating oil futures contract from the holder, and to sell a crude oil futures contract at the strike price.

Crack spread options offer several benefits:

- Refiners, blenders, and marketers have a flexible hedge against variable refining margins in heating oil and gasoline.
- Puts give refiners an instrument for locking in crude cost and product margins without forfeiting market gains.
- Crack spread options, in general, furnish traders with an efficient mechanism for hedging the changing relationship between crude and products.
- Crack spread options allow refiners to generate income by writing options.

## CALENDAR SPREAD OPTIONS

Calendar spread options help market participants mitigate the price risk that is present between the contract months of a futures contract; they are listed for light sweet crude oil, heating oil, gasoline, and natural gas.

Calendar spread options are European-style options that can be exercised into the underlying futures contracts only at the end of the contract month. The contracts are options contracts on the price



differential between two delivery dates for the same commodity. The price spread between contract months can be extremely volatile because energy is more sensitive to weather and news than nearly any other market. A change in the magnitude or direction of the month-to-month price relationships can expose market participants to severe price risk which could adversely affect the effectiveness of a hedge or the value of inventory. Calendar spread options can allow market participants who hedge their risk to also take advantage of favorable market moves.

To put market relationships in perspective, one must keep in mind two terms which describe the price curve. When the price for a contract month nearer to the present time is higher than the price for a contract further into the future, the market is said to be in backwardation. Typically, this means that prices are high because supplies are tight; in this case, the strike price for a calendar spread options contract will be a positive number.

Conversely, when the nearby price is less expensive than the farther-dated prices, the market is in contango. When the price curve is in contango, strike prices of calendar spread options contracts will be negative. A negative price is not unusual in spread relationships.

A commodity's price curve is likely to change over time. Calendar spread options can be used to manage the exposure a business has to these changes.

In contango markets, a refiner who sells heating oil would seek downside protection by buying puts; a buyer of heating oil would purchase calls. A refiner or marketer with excess storage capacity can make money when the price curve is in contango by purchasing the cheaper prompt month and selling the more expensive deferred contract month.

When the markets are in backwardation, however, spare storage capacity is an asset that generates no cash flow. Selling put options on calendar spreads generates cash flow, and having the asset as a backstop enables the oil company to sell the put.

Additionally, in a steeply backwardated market, it can be costly to buy back a hedge after it has appreciated in value on its way to becoming the prompt month. Buying calls on the calendar spread can reduce such costs, and can compliment the short hedge by allowing for participation in the rising market.

At exercise, the buyer of a put options contract receives a short position in the futures market for the closer month and a long position in the futures market for the further-dated month. The buyer of a call options contract receives a long position in the futures market for the closer month and a short position in the futures market for the further month.

## AVERAGE PRICE OPTIONS

Average price options are settled against the average of prices for an underlying commodity over a period of time, and are useful as a way of dampening market volatility. They are financially settled upon expiration and cannot be exercised into the underlying futures contract.

The settlement price for an average price call options contract is the difference between the average front month settlement price over the calendar month of the underlying futures contract and the strike price. The settlement price of an average price put options contract is the difference between the strike price and average front month settlement price over the calendar month of the underlying futures contract. The Exchange lists average price options for crude oil, heating oil, and gasoline.

## EUROPEAN-STYLE LOOK-ALIKE OPTIONS

The cash-settled European-style energy options contracts available on the NYMEX ClearPort electronic system solely for clearing offer market participants flexible instruments for managing price risk in the crude oil, heating oil, and gasoline markets.

The options contracts allow market participants to negotiate their own strike prices and premiums for an options position on any contract month for which there is an underlying futures contract. The

transaction can then be submitted to the Exchange clearinghouse through NYMEX ClearPort. Other contract specifications relating to the underlying commodity and the expiration calendar are standardized.

European-style options are settled only on expiration day. These options contracts are settled in cash and cannot be exercised into the underlying futures contracts.

The strike prices for all European-style options are initially identical to the related floor-traded options contracts, although strike prices will be added on an as-needed basis. Registered users of NYMEX ClearPort or brokers can add strike prices by calling NYMEX customer service before noon each business day for listing on the next business day.

Cleared transactions are executed as exchange of options for options transactions.

## INVENTORY OPTIONS

The Exchange offers clearing services for over-the-counter options on the weekly crude oil and natural gas storage numbers released by the Energy Information Administration (EIA) of the U.S. Department of Energy. The options trade through an electronic auction in which the options prices are

based solely on the relative demand of participants — the more popular the strike, the greater its value. The options are offered for trading by ICAP Energy and cleared by the Exchange.

These contracts help market participants manage exposure to the impact of the inventory reports. The strike units of the options are the number of millions of barrels of crude oil or billions of cubic feet of natural gas that could potentially be the difference in primary inventory from the previous week's report.

The inventory statistics auctions are held the night before the release of the EIA weekly inventory reports. The change in the inventories determines which options are in-the-money and which are out-of-the-money. The premium collected from those holding out-of-the-money options is paid to those holding in-the-money options.

There are two types of inventory options:

- Vanilla options act as traditional puts and calls with the in-the-money options setting a floor under or a cap over the at-the-money strike price.
- Digital options pay a fixed amount for in-the-money contracts.

## OVER-THE-COUNTER OPTIONS

All aspects of an options contract are negotiable for options contracts that are true over-the-counter instruments. Strike prices, interest rates, days to expiration and other parameters can be set by the market participants. OTC options are not cleared and do not have the benefit of the financial protections of the Exchange clearinghouse.

## STRATEGIES

The versatility of options is illustrated by the examples of several strategies, which offer profit opportunities in advancing, declining, or relatively stable markets while reducing risk.

Dozens of strategies can be devised using various combinations of puts, calls, and futures contracts. Ultimately, a trader's view of the market, his objectives, and tolerance for risk will determine which particular strategy to use.

Each of the examples contains a brief description and a profit/loss profile that is examined with respect to changes in futures prices. Maximum profit and maximum loss at expiration are indicated on each chart. Profit/loss measures the change in value of the entire position implicit in each strategy,

including those cases in which multiple options and futures positions are examined. Net debits, credits, and deltas also reflect the entire position.

Options premiums were estimated using the Black-Scholes options pricing model. All strategies are based on NYMEX Division light sweet crude oil options and the COMEX Division gold options.

The crude oil contract is priced in dollars per barrel, 1,000 barrels per contract; the gold contract is priced in dollars per troy ounce, 100 ounces per contract.

The following assumptions were made:

- The crude oil futures price is \$50 per barrel when the position is established; the gold futures price is \$500 per ounce.
- Crude oil volatility is 30%. Gold volatility is 13%, unless stated otherwise.
- The interest rate is 5%.
- The option expires in 90 days from the time the position is established. The time to expiration affects option premiums.

In each example, debits are funds paid out by the buyer of the position and credits are funds received by the seller, or writer, of the option position.

The delta is the amount, in percent, by which an option premium will change relative to a change in the underlying futures price. Deltas are positive for bullish options positions and negative for bearish options positions. The strategies are:

- Short out-of-the-money call
- Long Out-of-the-money call
- Short out-of-the-money put
- Bull call spread
- Bear put spread
- Long at-the-money straddle
- Long strangle
- Short at-the-money straddle
- Short strangle
- Fence

#### SHORT OUT-OF-THE-MONEY CALL

A short out-of-the-money call is an options trade in which the seller conveys the right to the buyer to go long futures at a specific price at any time before expiration.

In exchange for the premium received, the writer of the call options contract is obligated to sell the

underlying futures contract at the strike price at any time prior to expiration, if a holder of the option chooses to exercise it.

This position maximizes profits if the underlying futures prices stay at the strike price or lower until expiration. Profits are limited to the premium received while risk is unlimited on the upside. Declining volatility is favorable to this position as is the passage of time.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell one \$62 crude oil call	\$2.71	\$2,710	-0.44

**Maximum risk:** Unlimited on the upside  
**Maximum profit:** \$2.71 per barrel or \$2,710 per contract  
**Breakeven futures price:** \$64.71

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell one \$570 gold call	\$8.51	\$851	-0.33

**Maximum risk:** Unlimited on the upside  
**Maximum profit:** \$8.51/oz or \$851 per contract  
**Breakeven futures price:** \$578.51



#### LONG OUT-OF-THE-MONEY CALL

This strategy is essentially a way to buy “disaster insurance” at relatively little cost. It is used for a bullish outlook and profits if prices rally. Profits are unlimited on the upside; risk is limited to the premium, regardless of where futures trade. An out-of-the-money call requires a stronger price move than an in- or at-the-money option to be profitable, but it is also less expensive. This trade is helped by increasing volatility, but the passage of time works against buy-call strategies.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
buy one \$63 crude oil call	\$2.34	\$2,340	0.40

Net Debit	\$2.34	\$2,340	
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**Maximum risk:** \$2,340 per position

**Maximum profit:** Unlimited on the upside

**Breakeven futures price:** \$65.34

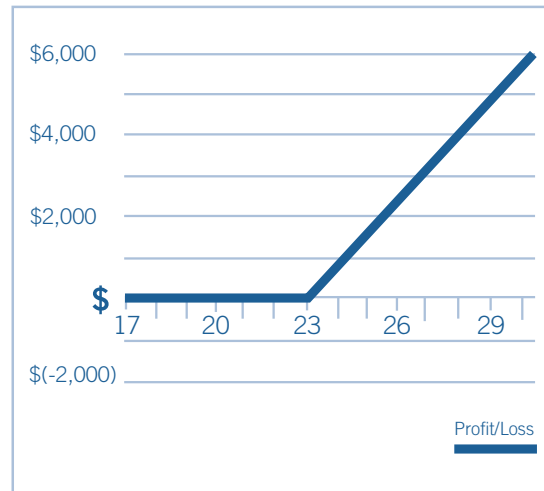
POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
buy one \$590 gold call	\$3.94	\$394	0.18

Net Debit	\$3.94	\$394	
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**Maximum risk:** \$394 per position

**Maximum profit:** Unlimited on the upside

**Breakeven futures price:** \$593.94



#### SHORT OUT-OF-THE-MONEY PUT

A short put is an options trade in which the seller conveys to the buyer the right to sell, or go short, futures at a specific price for a specific period of time.

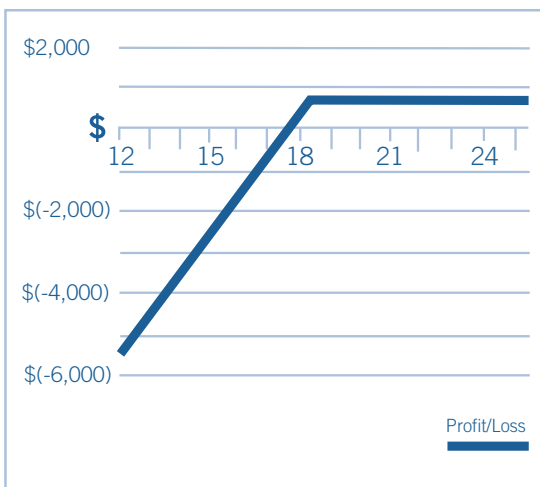
In this example, the writer of the put option is obligated to buy the underlying crude futures at \$15 a barrel, or gold futures at \$390 per ounce, at any time up to expiration if the holder of the option chooses to exercise it. The position realizes maximum profits if crude oil futures are trading at \$15 or above, or gold is trading at \$390 or above at expiration, making it unlikely that the option will be exercised. Profits are limited to the premium received, while risk is theoretically unlimited if futures prices fall. Declining volatility is favorable to this trade, as is the passage of time.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell one \$58 crude oil put	\$2.59	\$2,590	0.38

**Maximum risk:** Unlimited on the downside  
**Maximum profit:** \$2.59 per barrel or \$2,590 per contract  
**Breakeven futures price:** \$55.41

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell one \$540 gold put	\$11.68	\$1,168	0.39

**Maximum risk:** Unlimited on the downside  
**Maximum profit:** \$11.68/oz or \$1,168 per contract  
**Breakeven futures price:** \$528.32



## BULL CALL SPREAD

A bull call spread is a combination of a long call with an at-the-money strike price, and a short call with a higher strike price. Both options have the same expiration date.

This is a bullish position which allows a trader to establish a long market position with limited risk and low cost.

The trader buys an at-the-money call which he will exercise should prices rise, as he feels they will. However, unlike someone with an outright long position, the trader, “an unsure bull,” feels there is a distinct possibility that prices will fall, so he sells a call with a higher strike price. This lets him collect a premium to partially offset the cost of his long position, with a somewhat lesser chance that this option will be exercised.

However, if prices do rise, and he is called upon to provide a futures contract at the higher strike price, he can turnaround and exercise the at-the-money call he purchased and buy a futures contract.

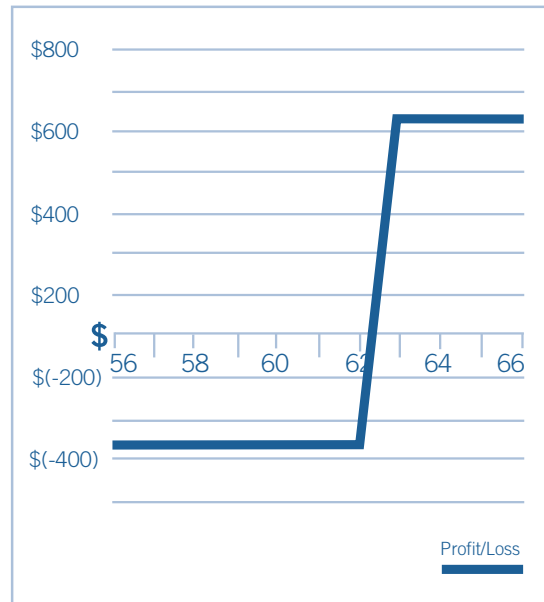
Risk is limited to the net debit. Maximum profits are equal to the difference between strike prices minus the net debit.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$62 crude oil call	\$2.71	\$2,710	0.44
Sell one \$63 crude oil call	\$2.34	\$2,340	-0.39
Net Debit	\$0.37	\$370	
Net Delta			0.05

**Maximum risk:** \$0.37 per barrel or \$370 per position  
**Maximum profit:** \$0.63 per barrel or \$630 per position  
**Breakeven futures price:** \$62.37

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$560 gold call	\$11.97	\$1,197	0.44
sell one \$580 gold call	\$5.88	\$588	-0.25
Net Debit	\$6.09	\$609	
Net Delta			+0.17

**Maximum risk:** \$3.09 per ounce or \$609 per position  
**Maximum profit:** \$13.91 per ounce or \$1,391 per position  
**Breakeven futures price:** \$566.09



### BEAR PUT SPREAD

A bear put spread is a combination of a long put with an out-of-the-money strike price and a short put with a lower strike price. Both options have the same expiration date.

This is a bearish position which allows a trader to establish a short market position with limited risk and low cost. The strategy makes sense in a low-volatility market.

Risk is limited to the net debit. Maximum profits are equal to the difference between strike prices minus the net debit.



POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$58 crude oil put	\$2.59	\$2,590	-0.38
Sell one \$56 crude oil put	\$1.81	\$1,810	0.29
Net debit	\$0.78	\$780	
Net delta			-0.09

**Maximum risk:** \$0.78 per barrel or \$780 per position  
**Maximum profit:** \$1.22 per barrel or \$1,220 per position  
**Breakeven futures price:** \$57.22

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$540 gold put	\$11.68	\$1,168	-0.39
Sell one \$530 gold put	\$7.98	\$798	0.31
Net debit	\$3.70	\$370	
Net delta			-0.08

**Maximum risk:** \$3.70 per ounce or \$609 per position  
**Maximum profit:** \$6.30 per ounce or \$1,391 per position  
**Breakeven futures price:** \$536.30

## LONG AT-THE-MONEY STRADDLE

The long at-the-money straddle is initiated during unstable market conditions when the trader feels prices could move sharply in either direction. The position, which “straddles” the market, is also called a volatility trade because it profits when the market moves sharply in either direction.

By purchasing an at-the-money call and a put, the trader locks in the strike price. In a rising oil market, for example, he exercises his call and buys futures for \$16, no matter how high futures prices go. The same holds true for gold, assuming futures are trading at \$400.

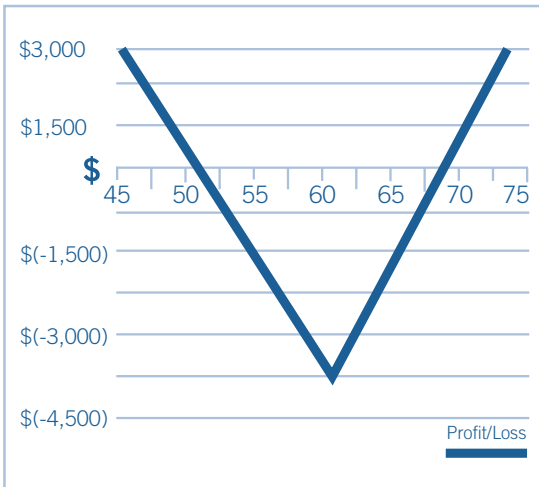
If prices fall, his put option has locked in a sales price of \$16, no matter how low futures prices go. Profits are unlimited in either direction. Losses are limited to the total premium paid.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$60 crude oil call	\$3.56	\$3,560	0.53
Buy one \$60 crude oil put	\$3.56	\$3,560	-0.47
Net Debit	\$7.12	\$7,120	
Net Delta			0.06

**Maximum risk:** \$7.12 per barrel or \$7,120 per position  
**Maximum profit:** Unlimited in either direction  
**Breakeven futures price:** \$52.88 and \$67.12

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$550 gold call	\$16.34	\$1,634	0.51
Buy one \$550 gold put	\$16.34	\$1,634	-0.49
Net Debit	\$32.68	\$3,268	
Net Delta			0.02

**Maximum risk:** \$32.68 per ounce or \$3,268 per position  
**Maximum profit:** Unlimited in either direction  
**Breakeven futures price:** \$517.32 and \$582.68



## LONG STRANGLE

A long strangle is similar to the long straddle, but is less costly to execute because the options are out of the money. This strategy requires a larger price move to be profitable; it would be used during extremely volatile price moves because of its lower execution costs.

Profits are theoretically unlimited in either direction. Losses are limited to the premium paid.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$61 crude oil call	\$3.11	\$3,110	0.49
Buy one \$59 crude oil put	\$3.05	\$3,050	-0.43
Net Debit	\$6.16	\$6,160	
Net Delta			0.06

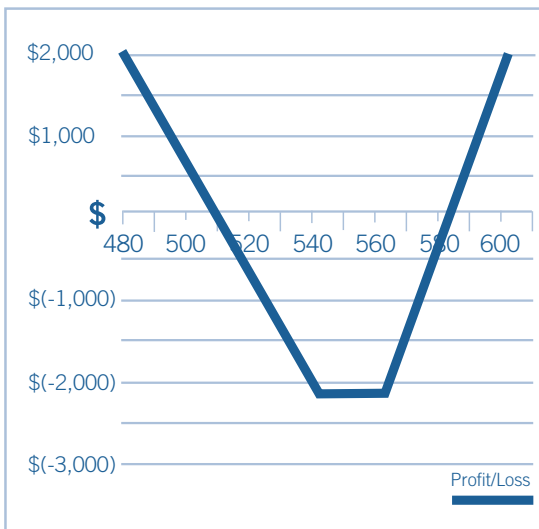
**Maximum risk:** \$6.16 per barrel or \$6,160 per position  
**Maximum profit:** Unlimited in either direction  
**Breakeven futures price:** \$52.84 and \$66.16

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$560 gold call	\$11.97	\$1,197	0.42
Buy one \$540 gold put	\$11.68	\$1,168	-0.39
Net Debit	\$23.65	\$2,365	
Net Delta			0.03

**Maximum risk:** \$23.65 per ounce or \$2,365 per position

**Maximum profit:** Unlimited in either direction

**Breakeven futures price:** \$516.35 and \$583.65



## SHORT AT-THE-MONEY STRADDLE

A short straddle is a combination of a short put and a short call with the same strike price and expiration date. Short straddles are also called short volatility trades because the position profits if the market is stable.

Profits are limited to the premium received. Risk is unlimited in either direction because if futures price move, one option will be in-the-money and is likely to be exercised. This position takes advantage of premium income and steady markets. Short straddles must be monitored closely because of the great potential risk.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell one \$60 crude oil call	\$3.56	\$3,560	-0.53
Sell one \$16 put	\$3.56	\$3,560	0.47
Net Credit	\$7.12	\$7,120	
Net Delta			-0.06

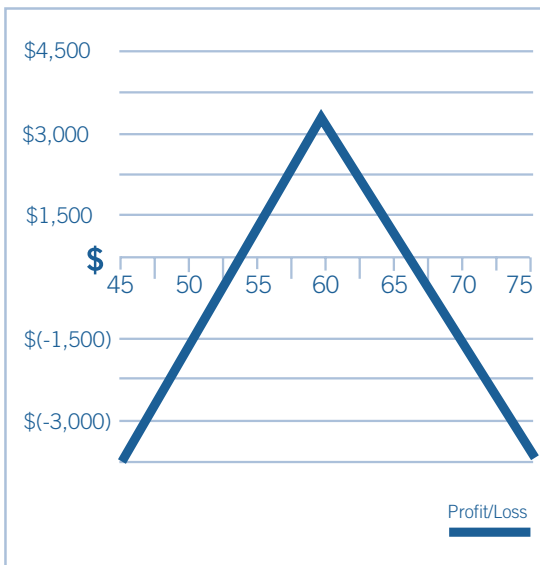
**Maximum risk:** Unlimited in either direction

**Maximum profit:** \$7.12 per barrel or \$7,120 per position

**Breakeven futures price:** \$52.88 and \$67.12

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell one \$550 gold call	\$16.34	\$1,634	0.51
Sell one \$550 gold put	\$16.34	\$1,634	-0.49
Net Credit	\$32.68	\$3,268	
Net Delta			0.02

**Maximum risk:** Unlimited in either direction  
**Maximum profit:** \$32.68 per ounce or \$3,268 per position  
**Breakeven futures price:** \$517.32 and \$582.68



## SHORT STRANGLE

A short strangle is similar to a short straddle, but the short call and short put have different strike prices. This trade is less costly to execute and is somewhat less risky because the strike prices are out-of-the-money.

The position profits in stable markets.

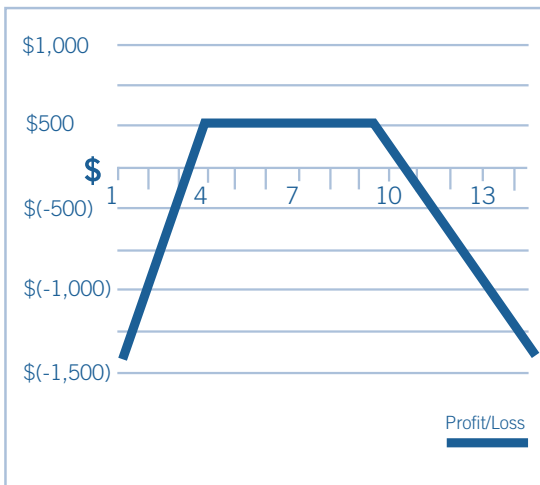
Profits are limited to the premium received. Risk is unlimited in either direction. This position takes advantage of premium income and steady markets. Short strangles must be monitored closely because of the high potential risk.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell one \$61 crude oil call	\$3.11	\$3,110	0.49
Sell one \$59 crude oil put	\$3.05	\$3,050	-0.43
Net Credit	\$6.16	\$6,160	
Net Delta			0.06

**Maximum risk:** Unlimited in either direction  
**Maximum profit:** \$6.16 per barrel or \$6,160 per position  
**Breakeven futures price:** \$52.84 and \$66.16

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Sell a \$560 gold call	\$11.97	\$1,197	0.42
Sell a \$390 gold put	\$11.68	\$1,168	-0.39
Net Credit	\$23.65	\$2,365	
Net Delta			0.03

**Maximum risk:** Unlimited in either direction  
**Maximum profit:** \$23.65 per ounce or \$2,365 per position  
**Breakeven futures price:** \$516.35 and \$583.65



## FENCE

A fence entails buying a futures contract and hedging it with the purchase of an out-of-the-money put and the sale of an out-of-the-money call. The premium received from the call sale is used to subsidize the purchase of the put. Therefore, the net cost is low but the upside profit potential is limited.

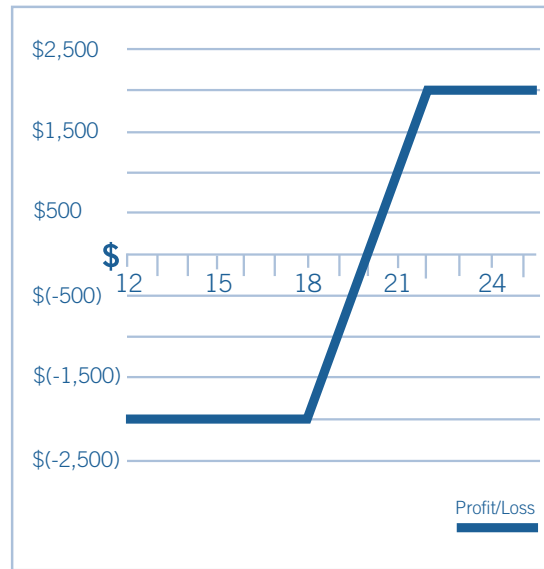
A fence offers a hedger unlimited downside protection by essentially putting a floor under his physical inventory. For example, the gold hedger in this example has full downside protection should gold trade at less than \$390.10 per ounce. If the market trades between \$400 and \$410, he captures all of the value of the premium on his short call. Profits are limited if prices rally to the call's strike price or higher. The profit/loss profile is the same as a bull call spread strategy.

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$16 crude oil futures			+1.00
Buy one \$15 put	\$0.64	\$640	-0.32
Sell one \$17 put	\$0.70	\$700	-0.40
Net Debit	\$0.06	\$60	
Net Delta			+0.28

**Maximum risk:** \$940 per position  
**Maximum profit:** \$1,060 per position  
**Breakeven futures price:** \$15.94

POSITION	PREMIUM	DOLLAR PREMIUM	DELTA
Buy one \$16 gold futures			+1.00
Buy one \$390 put	\$2.50	\$250	-0.25
Sell one \$410 put	\$2.60	\$260	-0.27
Net Debit	\$0.10	\$10	
Net Delta			+0.48

**Maximum risk:** \$9.90/oz or \$990 per position  
**Maximum profit:** \$XXXX per position  
**Breakeven futures price:** \$399.90





## GLOSSARY

## GLOSSARY

**American Option** – An option contract that may be exercised at any time prior to expiration. This differs from a “European option,” which may only be exercised on the expiration date. New York Mercantile Exchange options are American style options except for the average price and look alike options.

**Assignment** – The process by which the seller of an option is notified of the buyer’s intention to exercise the rights associated with the option.

**At-the-Money** – An option whose exercise, or strike, price is closest to the futures price.

**Bear Spread** – An options position comprised of long and short options of the same type, either calls or puts, designed to be profitable in a declining market. An option with a lower strike price is sold and one with a higher strike price is bought.

**Bull Spread** – An options position composed of both long and short options of the same type, either calls or puts, designed to be profitable in a rising market. An option with a lower strike price is bought and one with a higher strike price is sold.

**Calendar Spread** – An options position constitutes the purchase and sale of two option contracts of the same type that have the same strike prices but different expiration dates. Also known as horizontal, or time, spreads.

**Call Option** – An option that gives the buyer (holder) the right, but not the obligation, to buy a futures contract (enter into a long futures position) for a specified price within a specified period of time in exchange for a one-time premium payment. It obligates the seller (writer) of an option to buy the underlying futures contract (enter into a short futures position) at the designated price, should the option be exercised at that price.

**Conversion** – A delta-neutral arbitrage transaction involving a long futures, a long put option, and a short call option. The put and call options have the same strike price and same expiration date.

**Covered Writing** – The sale of an option against an existing position in the underlying futures contract. For example, short call and long futures.



**Delta** – The sensitivity of an option's value to a change in the price of the underlying futures contract, also referred to as an option's futures-equivalent position. Deltas are positive for bullish options positions, for calls, and negative for bearish options positions, for puts. Deltas of deep in-the-money options are approximately equal to one; deltas of at-the-money options are 0.5; and deltas of deep out-of-the-money options approach zero.

**European Option** – An option that may be exercised only on its expiration date.

**Exercise** – The process of converting an options contract into a futures position.

**Exercise Price** – The price at which the underlying futures contract will be bought or sold in the event an option is exercised, also called the strike price.

**Expiration Date** – The date and time after which trading in options terminates, and after which all contract rights or obligations become null and void.

**Extrinsic Value** – The amount by which the premium exceeds its intrinsic value. Also known as time value.

**Hedge Ratio** – 1) Ratio of the value of futures contracts purchased or sold to the value of the cash commodity being hedged, a computation necessary to minimize basis risk. 2) The ratio, determined by an option's delta, of futures to options required to establish a riskless position. For example, if a \$1/barrel change in the underlying crude oil futures price leads to a \$0.25/barrel change in the option premium, the hedge ratio is 4 (four options contracts for each futures contract).

**Historical volatility** – The annualized standard deviation of percent changes in futures prices over a specific period. It is an indication of past volatility in the marketplace.

**Implied Volatility** – A measurement of the expected price range of the underlying commodity futures based on the market-traded option premiums.

**In-the-Money** – An option that can be exercised and immediately closed out against the underlying futures market for a cash credit. The option is in-the-money if the underlying futures price is above a call option's strike price, or below a put option's strike price.

**Intrinsic Value** – The amount by which an option is in-the-money. An option which is not in-the-money has no intrinsic value. For calls, intrinsic value equals the difference between the underlying futures price and the option's strike price. For puts, intrinsic value equals the option's strike price minus the underlying futures price. Intrinsic value is never less than zero.

**Naked Option** – A short options position taken without an offsetting position in the futures market.

**Out-of-the-Money** – An option which has no intrinsic value. For calls, an option whose exercise price is above the market price of the underlying future. For puts, an option whose exercise price is below the futures price.

**Premium** – The price or cost of an option. For exchange-traded options, the premium is determined competitively by buyers and sellers in open trading during trading hours.

**Put Option** – An option which gives the buyer, or holder, the right, but not the obligation, to sell a futures contract at a specific price within a specific period of time in exchange for a one-time premium payment. It obligates the seller, or writer, of the option to buy the underlying futures contract at the designated price, should an option be exercised at that price

**Spread (Options)** – The purchase and sale of two options which vary in terms of type (call or put), strike prices, expiration dates, or both. May also refer to an options contract purchase (sale) and the simultaneous sale (purchase) of a futures contract for the same underlying commodity.

**Straddle (Options)** – The purchase or sale of both a put and a call having the same strike price and expiration date. The buyer of a straddle benefits from increased volatility, and the seller benefits from decreased volatility.

**Strangle** – An option position consisting of the purchase or sale of put and call options having the same expiration but different strike prices.

**Strike Price** – The price at which the underlying futures contract is bought or sold in the event an option is exercised. Also called an exercise price.





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