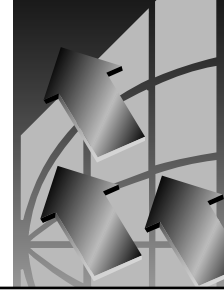




C M E

OPEN INTERESTS

Using S&P 500
Stock Index Futures
and Options



Introduction

What are S&P 500® futures and options on futures? Where do they come from? What can they do for you as an investor? These are some of the questions this strategy paper will help you answer.

Stock price index futures and options are contracts that allow you to effectively buy or sell an extremely well-diversified portfolio of stocks. They are also opportunities, chances to make investment decisions based on your opinion of the overall stock market. The center of trading in these contracts is the Chicago Mercantile Exchange (CME). In 1982 the CME introduced the S&P 500 Stock Index futures contract, which represents over 90% of all U.S. stock index futures trading.

Stock index futures and options are powerful and versatile instruments, whether you intend to risk your own capital for investment reward, or wish to insulate your investment capital from risk. They afford some unique advantages, allowing you to:

- Participate in broad market moves, with one trading decision, without having to select individual issues;
- Protect the value of a portfolio during adverse markets without incurring high transaction fees;
- Benefit from a bull market move even before funds become available to purchase stock.

The pages that follow will give you a fuller explanation of the benefits and versatility these contracts can provide to your investment program. S&P 500 futures and options at the Chicago Mercantile Exchange have enjoyed tremendous growth in trading volume, evidencing their wide acceptance. Let's look at some of the reasons why.

The Index: A Proxy for the Market

Before beginning the study of the S&P 500 products at the CME, you should understand the index on which they are based. The S&P 500 composite stock price index is designed to be an accurate proxy for a diversified portfolio of highly capitalized, blue-chip stocks.

The S&P 500 Index is based on the stock prices of 500 different companies — generally 80 percent industrials, 3 percent utilities, 1 percent transportation

companies and 15 percent financial institutions. The market value of the 500 firms is equal to approximately 80% of the value of all stocks traded on the New York Stock Exchange.

The four broad industry groupings are maintained in order to monitor the index's continued diversification. The number of companies in each grouping changes from time to time, to allow S&P more flexibility in choosing new companies for the Index when openings occur.

The S&P 500 is a capitalization-weighted index reflecting the market value of the 500 listed firms. Each component stock's price is multiplied by the number of common shares outstanding for that company, and the resulting market values are totaled. The total market value of the 500 companies is then divided by a number called the Index Divisor. The total market value of all the 500 firms is compared to that for the base period (1941-1943 = 10) to derive the Index value.

Because the Index is weighted in this manner, a price change in any one stock will influence the index in proportion to the stock's relative market value. The Index thus shows you the relative importance of each stock price change, gauging dollar-value market forces.

Adjustments to the Index

The S&P 500 Index is widely recognized as the benchmark by investment professionals because of Standard & Poor's years of experience and integrity in index construction and maintenance. Standard & Poor's is not involved in the trading of securities, and acts independently of the CME in decisions regarding the maintenance of the index.

S&P adjusts the Index to avoid distortion when there are stock splits or dividends, other distributions or purchases of shares by the component company itself, mergers, acquisitions or divisional spin-offs. In each case S&P modifies the Index (through the divisor used to compare current to base value) between trading sessions. The Index then remains at the same value on the opening of trading as it was at the prior close, and any performance difference is insignificant.

S&P 500 Futures

You can use stock index futures to shift the risk of stock market changes or to rebalance your portfolio. Or, if you believe that you can forecast the market's direction and want to position yourself to profit from such a move, these contracts hold opportunities for you.

What Are You Trading?

A futures contract is an agreement between seller and buyer to respectively deliver and take delivery of a commodity at a specified future date. In the case of S&P 500 futures, the commodity is a portfolio of stocks represented by a stock price index. The delivery is actually a cash settlement of the difference

THE VALUE OF FUTURES

The value of the S&P 500 futures contract can be calculated by multiplying the futures price by \$250. For example, with a price of 1350.00, the value would be $\$250 \times 1350.00$, or \$337,500. The minimum trading price change (tick) for the contract is .10, so a tick up or down in the futures price, say from 1350.00 to 1350.10, has a value of \$25 per contract ($\$250 \times .10$).

between the original transaction price and the final price of the index at the termination of the contract. More accurately, the cash settlement occurs in increments daily until the termination of the contract, as the contract trading price changes.

The futures contract price responds to changes in the underlying index, with the index recalculated as the component stock prices change. The price of the futures contract looks very much like the index price itself; however, the futures price may be higher or lower than the index, depending upon factors to be discussed a little later. While the futures price does not move point-for-point with the index, it tracks closely enough to act as an effective proxy.

The Long and the Short of Futures

A long position holder, one who has bought a contract, profits from a rising futures price and contract value, because he could then sell at a higher price to offset or liquidate the position. A short position holder, one who has sold a contract, profits from a price decline, because he could then buy in at a lower price to offset or liquidate the position. The long and the short sides of the original transaction are separated so that each can trade with any other party to liquidate his position at any point.

Both the buyer and the seller of a futures contract establish performance bond accounts with their brokers. These funds, a small fraction of contract value, serve as a security deposit guaranteeing performance. The account is debited or credited for the position's daily gains or losses.

Positions are re-valued or marked-to-market at times throughout the day. If you had bought (gone long) the futures contract at 1350.60 and the price rose to 1350.70, you would have \$25 in cash added to your account ($\$250 \times .10 = \25). If the price had fallen to 1350.50, \$25 would be deducted from your account. If your account falls below the designated maintenance level determined by your brokerage firm, you would have to meet a performance bond call to continue holding that position.

Futures positions can be held until a particular contract expires, or closed out (offset) at any time by an equal and opposite transaction. For example, assume your long September contract was marked to the close yesterday at 1350.50, and you decide to liquidate today. If you sell a September contract at 1350.10, your account will be debited for the difference, .40 points or \$100, and you would have no open position.

If you hold a position until the contract expires, the entire value of the contract does not change hands. There is a cash settlement instead of a delivery of securities. This takes the form of a final debit or credit to your trading account, marking the contract position from the futures settlement price on the last day of trading (Thursday) to the Special Opening Quotation of the index the next morning (the third Friday of the contract delivery month). This index quotation is calculated to the nearest .01, and it is special because it is determined by the official opening values of the 500 stocks, even if there are delayed openings in some stocks. The normal opening index quotation uses last sale prices for stocks until they open trading.

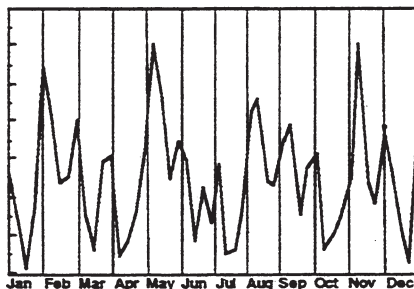
As an example of this final marking to the cash index, if you were short the expiring futures contract, which settles on Thursday at 1350.40, and the Special Opening Quotation is 1349.97, the .43 difference (.43 x \$250, or \$107.50) would be credited to the account as a final settlement. The short position would be closed, and no further obligation would exist.

Theoretical Fair Value

S&P 500 futures prices generally move with changes in the underlying index value, but the futures price is usually different than the current index value. There is a definite relationship between the current (or cash) index value and the futures price of that index. Supply and demand—sellers and buyers—determine the current futures price but, through arbitrage, market expectations are reined in as a futures pricing force.

Essentially, the futures contract serves as a substitute for owning the actual portfolio of stocks that forms the index. With either the futures or the cash portfolio, you have a capital interest in the stock prices. The index price difference arises from the fact that the actual stock holder receives dividends, but must pay full value for the stocks or pay interest on the margined amount. The futures contract holder receives no dividends, but deposits only a small fraction of the contract value as security. He can invest the remainder in other earning assets, such as Treasury bills.

TYPICAL DISTRIBUTION OF DIVIDEND PAYOUTS



Source: Standard & Poor's

Over periods of time, dividends can vary, causing the fair value futures price to change in relationship to the cash index. Arbitrage activity serves to smooth this relationship.

The chief difference between these alternatives, then, is the difference between the dividend return and the available return on other earning assets. In recent history, the average dividend yield on S&P 500 stocks has ranged between 1 and 3 percent. If money market yields are much higher, then the futures represent a better yielding alternative, and the futures price will be higher than the cash portfolio price (the current index value). Since these yields are time-related, the yield differential becomes less important as the contract maturity approaches,¹ until the futures price and the actual index converge at expiration.

In considering the purchase of a futures contract, you might not like to pay a premium over the current index, but you should realize that you are paying for real advantages. Aside from the yield differential, assembling a well-diversified stock portfolio is far more difficult and expensive than a futures purchase; and the portfolio is far less liquid than a futures position.

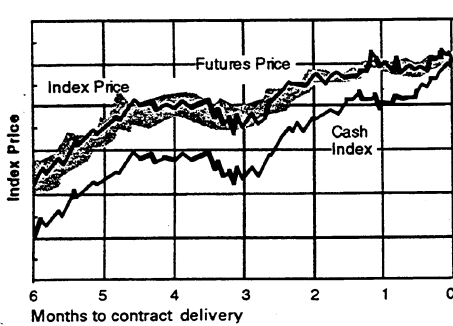
The sale of index futures, on the other hand, brings these transactional advantages as well as the usual ability to sell the futures at a premium. While this may seem an unfair advantage, the alternative — selling stocks instead of the futures — brings a cash inflow that the outright futures sale does not.

Arbitrage

If the futures price did not accurately reflect the yield differential, then a wise investor would buy the relatively cheap alternative, and sell the relatively expensive one. Because both alternatives have the same value on the futures

¹ Dividend payments are not smoothly distributed over time.

CASH VS. FUTURES PRICE RELATIONSHIP



This chart illustrates the convergence of the index futures price and the underlying cash index. The gray band describes the various arbitrageurs' transaction costs, and defines the fair value futures price. Any futures price outside the gray band represents arbitrage opportunity.

delivery date, the investor would be able to liquidate both stock and futures positions at a guaranteed profit. This is the process of arbitrage that enforces the fair value pricing relationship. Arbitrage transactions performed to take advantage of any disparity result in the cheaper alternative being bid up and the expensive being sold until the prices are in line.

The relative transaction cost and liquidity of the cash and futures positions enter into the arbitrageur's decision-making and thereby affect the pricing relationship. A pure arbitrage requires the purchase or sale of each of the index's component stocks in shares-outstanding proportions to replicate the S&P 500.

Large institutional investors and dealers maintain index-matching inventories of stocks to arbitrage. But for most investors the commission costs and the time and risk involved in executing so many transactions make pure arbitrage impractical. However, some traders are pursuing quasi-arbitrage, buying or selling smaller portfolios of stocks, designed to have good correlation with the index, against the futures contract.

The yield differential, and less significantly, transaction differences when applied to the current index value, form a theoretical fair value for the futures price. More accurately, they form a range, because arbitrageurs have different cost factors and return on investment requirements. If heated expectations in the futures market cause the futures price to stray outside this range, or if the interest rate changes, causing a change in the yield differential and fair value, arbitrageurs will draw the prices back into line.

Trading Opportunities

The most straightforward trading use of these futures contracts is to buy them (go long) in anticipation of a rising market and to sell them (go short) in anticipation of a falling market. You have numerous alternatives—choosing different delivery month contracts, spreading between contract deliveries, or using the futures in conjunction with S&P 500 options on futures. To form a trading strategy, you need: an opinion, formed from fundamental analysis of market factors and/or technical analysis of price trends; and a decision on acceptable levels of risks and rewards.

Professional dealers and traders typically trade the basis (the difference between the current cash index price and the futures price). As short-term interest rates change, the yield differential between stocks and other earning assets changes, and so does the basis. Basis traders monitor futures prices, and trade small price movements in large volume.

Less active traders typically look for larger-order movements. The primary effects of interest rate changes on the stock market are, after all, more obvious and important than the yield differential basis effects. Besides the various domestic economic indicators, such as unemployment, inflation or money supply, some traders watch the U.S. dollar exchange rate. Because the U.S. stock market can become an investment haven at times of dollar strength, large foreign investment flows can have a major effect.

A change in the taxation of dividends, capital gains or corporate profits could have a large impact on stock prices. Another important market factor is the trading activity of the institutional money managers who invest pension and mutual funds' resources.

In addition to researching supply and demand factors, many traders analyze the market technically. Technical analysis can take several forms, including the charting of price movement and trading volume to focus on buying or selling trends. These technicians try to predict trigger points in investor confidence, prices at which money will enter or leave the stock market. Other analysts concentrate on statistical searches of historical prices and economic data, looking for market waves and cycles.

Spreading the Contracts

Spread trading is a reduced-risk trading method that allows small or large traders to focus on the pricing relationship between related contracts. To take a spread position, you buy one contract and sell the other. The price difference is referred to as the spread. Because the contracts are related, both prices will tend to move in the same direction, with the spread price changing as they move in different degrees. Since the position includes both a long and a short contract, the spread trader expects to lose on one leg of the spread, but to profit more on the other leg.

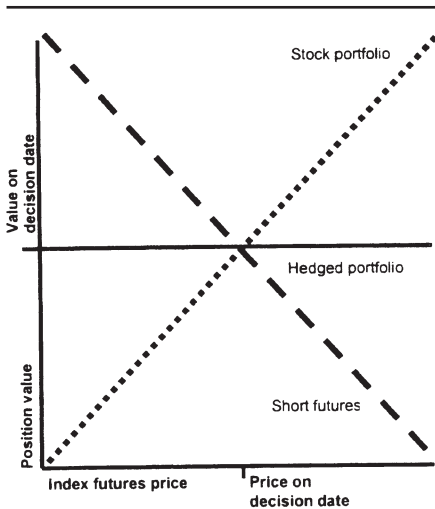
One type of spread, the calendar or time spread, can be placed to capture the index/futures yield differential change caused by an interest rate movement. For example, if you anticipate rising interest rates, sell the nearby contract and buy a later delivery contract. If short-term interest rates rise uniformly, the basis will widen more for the later delivery contract, because the yield differential is time-related. As a result, you would profit more from the distant contract long position than you would lose on the nearby contract short position.

Another type of spread is the intercommodity or intermarket spread. Index futures are available on several indexes that represent differing capitalizations. For example, if a trader thought that mid-capitalization stocks were going to outperform larger cap stocks, he/she would go long S&P MidCap 400 futures and simultaneously short S&P 500 futures. The trader would not be concerned if the market rallied or declined, but would only care about the disparity between the mid cap stocks and larger cap stocks. In addition, Russell 2000 futures and options trade at the CME and allow the spread trader to spread small cap stocks versus mid cap or large cap stocks.

In summary, spread trading allows traders to divorce themselves from trying to forecast the market's direction. Instead they are only concerned with the disparity or spread between two similar indexes since they are both long and short. Spreads also tend to reduce risk and thus carry lower performance bond requirements. They also serve to keep futures prices "in-line" in all expiration months.

Stock Portfolio Risk Management

FUTURES HEDGE



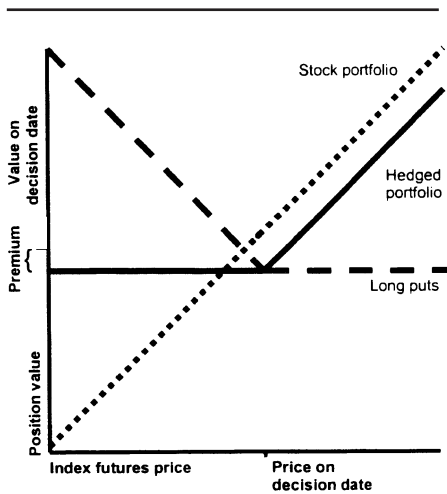
There are benefits and risks in all types of equity ownership. Prices of common stocks change and, whether individually or institutionally managed, shares of stock or portfolios are subject to the risks of adverse price moves. The risks of changes in portfolio values are classified in two general categories: diversifiable risk and market risk.

Diversifiable vs. Market Risk

The stock price of an individual firm is influenced by events and factors unique to that firm – an unexpectedly poor earnings report or a delay in production, for instance.

In a diversified portfolio, unexpected increases in the prices of some stocks are likely to offset unexpected decreases in the prices of others; the portfolio value as a whole may remain fairly constant. Diversifiable risk declines rapidly as the portfolio increases in the number of issues from one to 18 or so, but it is never eliminated completely.

OPTIONS HEDGE

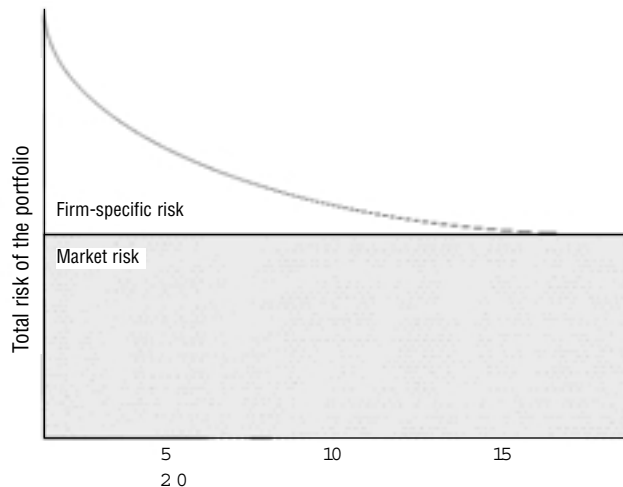


There's a limit to the risk-reduction potential of portfolio diversification. Some events have impact on the economic well-being of the entire market — for example, a change in U.S. monetary policy. This type of price variability is called market risk or systematic risk, and it is the major risk facing holders of diversified portfolios of stock.

Stock index futures and options contracts are a way to adjust the impact of market risk on the portfolio. By holding an appropriate number of futures or options contracts, you can insulate your portfolio value from market risk. Gains in the futures or options positions offset losses suffered by the stock portfolio.

This approach to risk management is called hedging. The practice of hedging simply involves the use of futures or options with the pre-existing or planned stock market investment to offset the change in value of the equity position by the performance of the futures or options positions.

REDUCTION OF FIRM-SPECIFIC RISK THROUGH DIVERSIFICATION



Protecting Stock Investments

If you own a stock portfolio, you may be worried about a market decline, but may not be ready to sell stocks – for any of a variety of reasons. The tax consequences of a sale might be significant, or there may be an opportunity for substantial dividends. The commission cost of selling a variety of stocks may be high, and you may expect the decline to be only temporary. And, not the least, you may have selected the stocks in your portfolio carefully, in order to meet long-term objectives, and believe the reasons for continuing to own the stocks are sound even in the face of a general market decline.

Suppose you are holding a well-diversified portfolio of stocks valued at approximately \$4,000,000. You foresee a market decline, but you don't want to sell your stocks. You could provide coverage by selling index futures contracts or by buying index put options. In a declining market, the short futures or the long puts will yield profits to offset the losses on your stock holdings. If the market rallies, the futures or options position will show losses that would offset appreciation in your stock portfolio. The hedged position is generally stabilized in value until you liquidate the hedge.

To provide rough coverage, you would divide the portfolio value – \$4,000,000 – by the current index value times \$250. This is the number of contracts that would equate in value to the stock portfolio. However, a position of such size could be a fairly inaccurate hedge, because your stock portfolio can change in value to a different degree than the stock index.

Partial Hedges

Hedging need not neutralize an entire portfolio. If you are bullish about the market's long-term prospects, but foresee stable or declining stock prices just ahead, you can phase in a futures or options hedge. You could immediately initiate, say, 30 percent of the number of contracts for a complete hedge. If your near-term outlook proves correct and the stock market begins to decline, you may choose to increase your coverage, perhaps to 50 percent of the portfolio value. The hedge is maintained or increased as the stock market continues its downward movement. When your bullish outlook returns, remove the hedge by phasing it out in a similar manner, or by offsetting the entire position.

Partial hedge techniques offer incomplete protection against a stock market decline. Their main advantage: If market judgment proves wrong, the gains from the equity portfolio exceed the losses generated by the hedge position.

Full Hedge Coverage

To establish exact hedge coverage, first determine the portfolio beta – a statistic that describes the portfolio's tendency to rise or fall in value along with the market. It is a product of the statistical comparison of the portfolio's changing value over time to the changes in the relevant index value. You (or your trading advisor) would use the past prices of the stocks you currently hold, and the stock index values for the same time period.

A portfolio beta of 1.0 indicates that the portfolio value has moved over time in the same proportion as the index; a beta of .7 indicates that the portfolio value

has moved with the index, but only 70 percent as far on average for each index price change.

Continuing our example, you regress your \$4,000,000 portfolio against the S&P 500, and find the portfolio beta to be 1.175. Because the portfolio has tended to move 1.175 times as far as the index, this becomes the hedge ratio.

Anticipating a falling market, you could sell the futures so that they would compensate for stock portfolio losses. To find the number of contracts for full coverage, divide the portfolio value by the current S&P 500 Index, stated in contract value terms, and multiply by the (beta) hedge ratio. With the S&P 500 Index at 1350.00, the calculation is as follows:

$$\frac{\$4,000,000}{\$250 \times 1350.00} \times 1.175 \approx 14 \text{ contracts}^2$$

Full coverage with futures would require the sale of 14 contracts. You would neutralize the portfolio, expecting to neither gain nor lose materially on the overall stock/futures position. If you later decide to sell some stock from the portfolio, reduce the hedge position at the same time, recalculating the coverage with current values of the portfolio, the index and beta. As the hedging contracts approach the delivery date, if you wish to maintain the hedge, roll the hedge position into a later delivery contract. You would buy in the expiring futures (or let them expire), and sell S&P 500 futures contracts that have three months or more until delivery.

The recalculation of hedge coverage is periodically necessary because the portfolio beta reflects past price behavior, and is therefore not a perfect predictor. In general, the more diversified the portfolio is, the more constant beta will be. For a portfolio with only a few stock issues, the beta-derived inaccuracy of the hedge could be considerable, and hedge performance should be closely monitored.³

²The current index price is used, rather than the futures price, so that the hedged position will be equivalent to the alternative of selling the portfolio and investing in other earning assets.

³There is another statistic produced in the regression of the portfolio against the index, R², the coefficient of determination, which indicates the reliability of the beta statistic.

Anticipating Future Stock Purchases

Long futures positions or the purchase of call options can protect against a rising market, ensuring that the market does not far outstrip your ability to make planned stock purchases. Portfolio managers periodically receive funds to invest from various sources, including corporate contributions to pension funds, insurance premium payments from policy holders and dividends on stock holdings. With long futures or calls, investors can pre-position themselves in the market before receiving expected funds, and effectively fix the cost of future stock acquisitions.

Suppose you anticipate receiving a cash payment three months in the future. You plan to purchase a variety of stocks with the cash, but fear that the stock market will advance sharply by that time, and that the cash will purchase significantly fewer shares than at current market levels. To establish a price level for the future purchases, you could buy futures or calls roughly of the same value as the funds you expect to receive.

Divide the amount of the projected funds by the index value (i.e., current S&P Index x \$250) to arrive at the number of futures to use. When you know which stocks you will buy, calculate the beta of the portfolio of purchases, and use that as the hedge ratio, as in the prior portfolio protection example. If the next futures contract expiration date does not coincide with the date(s) of the planned purchase, you would probably buy the following delivery contracts and, as the stock purchases are made, offset the futures position.

Hedging Risks

Despite the precision involved in the design of some of the hedges described, you cannot expect an exact offset to every market move. Three risks must be considered.

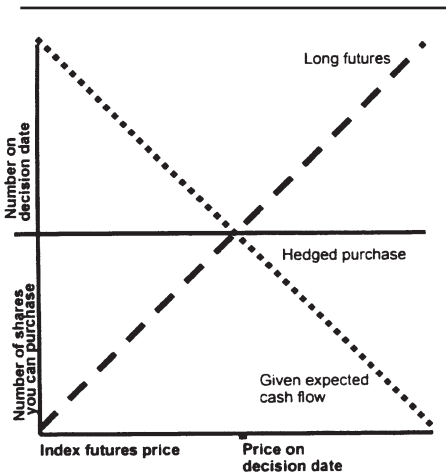
First, the largest risk is that the calculated beta proves to be inappropriate during the hedge period. A portfolio that performed with a given beta in the past may not perform with the same beta in the future. If the beta changes, the hedge performance may not exactly duplicate the change in the value of the portfolio.

Second, the percentage move of the futures price may be somewhat different than that of the underlying indexes. This risk — typically referred to as *basis risk*—may result in some profit or loss, but the dollar amount generally will be small relative to the value of the portfolio.

Finally, strict hedging stabilizes and insulates the portfolio value from any change — either up or down — that the market posts. Even so, when losses are generated by the futures position, these losses must be paid in cash. Large cash outlays could force short-term borrowing or a premature liquidation of either equity holdings or the futures position. This, of course, does not apply to long option hedges, because no performance bond is required.

While these risks must be recognized, they should not be overstated. You must weigh these hedging risks against the risk of adverse price movement that exists by holding any equity portfolio. A decision to hedge can be viewed as the exchange of market risk for a much smaller, more controllable risk.

FUTURES HEDGE



Portfolio Adjustments Using Index Futures

The application of index futures and options to portfolio management can take many forms. These contracts can be used to extend or neutralize stock market exposure. As a facilitating measure, a short futures position will secure a market level while a large sale of stocks is executed in an orderly fashion. Similarly, a long futures position can serve as a temporary hedge while a large purchase is completed.

Index contracts can help to achieve returns from superior selection of undervalued stocks. By eliminating general market risk, the portfolio return will approximate the risk-free rate plus the return from superior stock selection.

For market timing, the portfolio beta can be adjusted up or down with index contracts more readily than with cumbersome stock transactions. Long futures and calls will add to the portfolio beta; short futures and long puts will reduce the total position beta.

The number of contracts needed to adjust the total position beta is defined by the following equation:

Number of contracts =

$$\frac{\text{Current portfolio value} \times (\beta_{\text{desired}} - \beta_{\text{portfolio}})}{\text{Current Index} \times \$250}$$

A positive result indicates the number of long futures to use; a negative result, the number of short futures. If long options are used, further multiply by 1/delta.

Options on S&P 500 Futures

If you have experience with exchange-traded stock options, you should have little difficulty in applying the vocabulary and mechanics to options on S&P 500 futures. These contracts (S&P 500 options, in future references) share the characteristic that makes stock options appealing to many investors: limited risk.

What Are You Trading?

When you buy an S&P 500 option, you acquire the right to take a position at a specified price in the underlying S&P 500 futures contract at any time before the option expires. There are two types of options: calls and puts. Buying an S&P 500 call option gives you the right to take a long position in the underlying S&P 500 futures contract at a specific price; an S&P 500 put option gives the buyer the right to take a short position in the underlying S&P 500 futures contract at a specific price.

As an option buyer, you have the right — but *not* the obligation — to take positions in the underlying futures contract. The decision whether to enter the futures market is entirely up to you, the buyer. Rather than exercising the option, you may re-sell it in the market, or simply let the option expire if it has no practical value.

S&P 500 option sellers (also called writers) assume the obligation of taking a futures position opposite to the option buyer, if the seller is assigned for exercise of the options. In the case of an S&P 500 call, the writer stands ready to take a short futures position in the S&P 500 futures contract. In the case of an S&P 500 put option, the put writer stands ready to take a long position in the underlying S&P 500 futures contract. The option writer can liquidate his obligation at any time before he is assigned for exercise by buying an identical contract (a put if he sold a put, a call if he sold a call) to close the position. Just as with futures, the CME Clearing House acts as the intermediary between the option buyer and seller.⁴

Strike Prices and Expiration Months

The exercise price (or strike price) of an S&P 500 option is the price at which you would take an S&P 500 futures position if you were to exercise the option. Exercise prices are set at either 5- or 10-point intervals.

Option contracts are listed for all 12 calendar months. At any point, there will be options available for trading that expire in each of the next three calendar months, plus three further quarterly expirations.

On the first day of trading for options in a new contract month, exercise prices for puts and calls are listed above and below the settlement price of the underlying

⁴ The S&P option writer is required to post a performance bond deposit when the position is opened because it is the writer who must stand ready to take a futures position at a possibly unfavorable price at any time before the position is closed. The amount of performance bond required is recalculated daily until the option position is closed.

futures contract. After the first day of trading, new exercise prices for puts and calls are created based on the upward and downward movement of the underlying futures contract.

Each option expires in the latter half of the expiration month. The quarterly expirations (like the underlying futures contracts) terminate trading on the Thursday prior to the third Friday of the contract delivery month at 3:15 p.m. Chicago Time. The serial month contracts expire on the third Friday at 3:15 p.m.

Exercising Your Options

S&P 500 options at the CME are American style options. You may exercise an S&P 500 option on any business day the option is open for trading, including the day on which it is purchased. Exercise of an S&P 500 option contract results in an S&P 500 futures position effective on the next business day. Exercise of an S&P 500 call results in a long S&P 500 futures contract at the call's exercise price. Exercise of an S&P 500 put option results in a short S&P 500 futures contract at the put's exercise price.

You would want to exercise the call only if the current futures price is higher than the call's exercise price, and exercise the put only if the current futures price is lower than the put's exercise price. In either case, you would receive a futures position effective on the day following exercise, and your account would be credited the difference between the exercise price and the current futures price. You could hold the futures position, or liquidate it with an offsetting transaction.

If you were to exercise any of the options that expire within a calendar quarter, you would take a position in the futures contract. So if you exercise a January 1300 call, you would take a long position at 1300 in the March futures contract.

Quarterly S&P 500 options are cash settled. This cash settlement is based on the Special Opening Quotation of the S&P 500 Index on the third Friday of the contract month. At expiration, the value of a quarterly S&P 500 call is the amount the S&P 500 Index is above the call's exercise price; the value of a quarterly S&P 500 put is the amount the S&P 500 Index is below the put's exercise price.

If the Special Opening Quotation of the Index is at the same price or at any price below the exercise price of an expiring S&P 500 call, or at the same price or any price above the exercise price of an expiring S&P 500 put, the option expires worthless. The CME Clearing House automatically exercises expiring quarterly in-the-money options unless you give specific instructions to the contrary. An in-the-money option is one that has cash value, and to let it expire unexercised is to waste that value.

Option Premiums

The premium is the price the S&P 500 option buyer pays to the option seller for the right to take a futures position at the exercise price. In order to simplify trading, premiums for S&P 500 options are quoted in terms of index points rather than a dollar value.

The dollar value of an option premium is equal to the option index price multiplied by \$250. As with the futures contract, the minimum price fluctuation, or tick, is .10, or \$25 ($\$250 \times .10$). To calculate the dollar value of the premium, multiply the quoted premium by \$250. Thus, an S&P 500 option premium quoted as 7.50 equals \$1,875.

The premium of an S&P 500 option is directly related to the underlying futures price, rather than to the current cash price of the Index. It is the likelihood that the futures will move profitably past the option's strike price that determines the value of the option. This possibility can be defined by the following three factors:

1. Relationship of the strike price of the option to the underlying futures price

If the current market price for S&P 500 futures is above the strike price for a call (or below the strike price for a put), the option is said to have intrinsic value.

The intrinsic value of a call option can be determined by subtracting its exercise price from the underlying futures price; in the case of a put, it is determined by subtracting the futures price from its exercise price. If the difference is positive, the option has intrinsic value.

An S&P 500 March 1270 call option has an intrinsic value of 2.30 if the March S&P 500 futures contract is at 1272.30; but at this futures price, the March 1270 put option has no intrinsic value ($1270.00 - 1272.30 = -2.30$, or 0). An S&P 500 March 1270 put has an intrinsic value of 2.30 if the March S&P 500 futures contract is at 1267.70.

An option with intrinsic value is said to be "in-the-money." The option premium will equal or exceed its intrinsic value. An option with no intrinsic value is said to be "out-of-the-money." The distance between the exercise price and the futures price affects the likelihood that the option will go in-the-money, and therefore affects the market price of the option.

2. Time

The more time that remains until an option's expiration, the higher the premium tends to be. The longer time period provides more opportunity for the underlying futures price to move to a point where the purchase or sale of the futures at the strike price becomes profitable. Therefore, an option with six months remaining until expiration will have a higher premium than an option with the same strike price/futures price relationship with only three months until expiration. The time component of an option's value tends to be largest when the underlying S&P 500 futures contract is trading near the exercise price of the S&P 500 option — that is, when an option is "at-the-money."

An option is a wasting asset. As the option approaches its maturity, the time value declines to zero. At expiration, the option's value is only its in-the-money amount.

3. Volatility

There is a simple, but significant, relationship between volatility and premium: The greater the volatility, or fluctuation in price of the futures, the higher the premium. Higher volatility means a greater chance for the option to go (further) in-the-money by the expiration date.

The "Greeks"

In the prior section, we discussed some of the factors that influence options prices in a qualitative fashion. For example, we know that options are wasting assets, that each day that passes, the option loses some value. The question arises: How much will an option lose each day? Can it be quantified? If volatility rises by 1 full percentage point, exactly how much will an option be affected? These questions and others can be answered by studying the concepts of delta, gamma, theta and vega. These four "derivatives" (named as such because they are derived from popular option pricing models) give the trader excellent information as to how options premiums are affected by the underlying price, strike price, time to expiration and volatility.

Delta

Delta is the rate of change of an option's premium in relation to the change in the underlying futures price. The delta is expressed in percentage terms. Because option's premiums do not always move by the same amount as the underlying futures price, this delta factor is used. Generally, a change in the underlying futures price will result in a smaller change in the option premium. Suppose that an S&P 500 futures price rises by 1.00 point, and a call option on that contract rises by .50 points. It is obvious that the option premium gained only about $\frac{1}{2}$ of what the futures price did. This would indicate that particular call option's delta is 50%. If the underlying futures fell in price, delta could help predict a similar loss in the value of the options premium. Deltas range from 0% (deep out-of-the-money options) to nearly 100% (options that are deep-in-the-money). At-the-money options have deltas of approximately 50%. Note for example in Table 1, the at-the-money call (1300 call in this case) has a delta of 50.5%. It would move only about half as much as the underlying. However, the 1270 call is somewhat in the money (by 30 S&P 500 points) and has a higher delta — 80.4%. For every 1.00 point movement in the underlying, the 1270 call option will move .80 points.

Table 1

Futures Price: 1300.00 Volatility: 20.0% Time to expiry: 1 week

Call Strike	Theoretical Price	Delta	Gamma	Theta	Vega
1320	6.6	29.5	1.0	.89	.62
1310	10.0	39.6	1.1	.99	.69
1300	14.4	50.5	1.2	1.03	.72
1290	19.8	61.5	1.1	.98	.69
1280	26.4	71.6	0.9	.87	.61
1270	33.9	80.4	0.8	.71	.50

You can see then, that deltas change with the futures price. As futures move from in-the-money to at-the-money to out-of-the-money, the delta will decrease. Conversely, deltas will increase as futures move from out-of-the-money to at-the-money to in-the-money. Deltas are not static but dynamic. Changes in delta can also be quantified. The change in delta is called gamma.

Gamma

Gamma will tell you how much the delta will change when futures prices increase. For example, using Table 1, the 1300 call has a delta of 50.5%. If the futures move up 1.00 point, the option will gain about .50 points. The gamma of the 1300 call is 1.2%. If futures increase by 1.00 then the delta (not the option premium) will increase by 1.2 percentage points ($50.5 + 1.2 = 51.7$) to 51.7. In other words, the option premium will increase or decrease in value at the rate of 50.5% of the futures price before the +1.00 point futures move and 51.7% after the +1.00 point futures move. Again, gammas are not static but are constantly changing as the underlying moves up or down.

Theta

Theta is the derivative that measures how much an option will lose in value due to the passage of time. Simply put, it measures time-decay. We know options are wasting assets — they lose a little bit of time-value every day (good for the option writer, bad for the buyer). Theta quantifies how much an option will lose as each day passes. Again, refer to Table 1. Take the 1300 call options example, which has a theta of 1.03. This means that by tomorrow, the 1300 call will lose 1.03 points (assuming no changes in any other input) and will be worth only 13.37 points ($14.4 - 1.03 = 13.37$). Remember too, that time decay is not linear. It accelerates as expiration draws closer. Put another way: If there are 100 days until expiration and one day passes, how much time premium has eroded? About 1/100th. Suppose there are 10 days to expiry and 1 day passes? In this case 1/10th of the time has eroded.

Vega

Sometimes called zeta or kappa, vega is the derivative that measures the amount of premium gained or lost due to a 1 percentage point change in volatility. For example, at 20% volatility, the 1300 call has a theoretical value of 14.4. Its vega is .72 points. If volatility were to advance to 21%, the 1300 call would gain .72 points. Obviously, higher volatility works against options writers and in favor of options buyers. If volatility dropped from 20% to 19%, the 1300 call would lose .72 points. In summary, vega gives you an idea of how sensitive an option is to perceived changes in market volatility.

The “Greeks” – A Summary

The “Greeks” are essential to determining an option’s value. While futures traders deal with two “dimensions” (the up and down movement of a contract), options traders have to work with four “dimensions”: the futures price and strike price (delta and gamma) as well as time decay (theta) and changing volatility (vega). Each of these variables affects an options position, whether it be a simple long call or put or a complex position involving multiple strike prices and combinations of long/short options and/or futures positions. The very best options strategists would not conceive of implementing a position without knowing how these four inputs would influence their strategy.

Option Strategies: Flexibility in Action

Options are attractive because many of their uses involve known and limited risk. But another attraction is their flexibility: You can employ them in expectation of rising or falling markets, of stable or volatile markets.

The examples here show some ways to use S&P 500 options. However, all of the examples ignore transaction costs and taxes. Obviously, the impact of these factors may be significant. Consult your broker to determine transaction costs, and your tax counsel for tax treatment of options on futures transactions.

Profiting From a Rising Market — Buying Call Options on S&P 500 Futures

Scenario

It's October and you believe the stock market will begin a major advance, and decide to purchase an at-the-money call option with 2-3 months left until expiration. With the December futures contract at 1300, you purchase an S&P 500 December 1300 call option with a premium of 18.00 points ($18.00 \times \$250 = \$4,500$).

Specifics

SPZ: 1300.00

Dec 1300 call option: 18.00 points

Outlook on market & volatility: Bullish

Risk/Reward Character of Position

Maximum Risk = Limited to premium paid:
18.00 points or \$4,500

Point of Maximum Risk = Dec. futures @1300.00 or lower
results in loss of entire premium

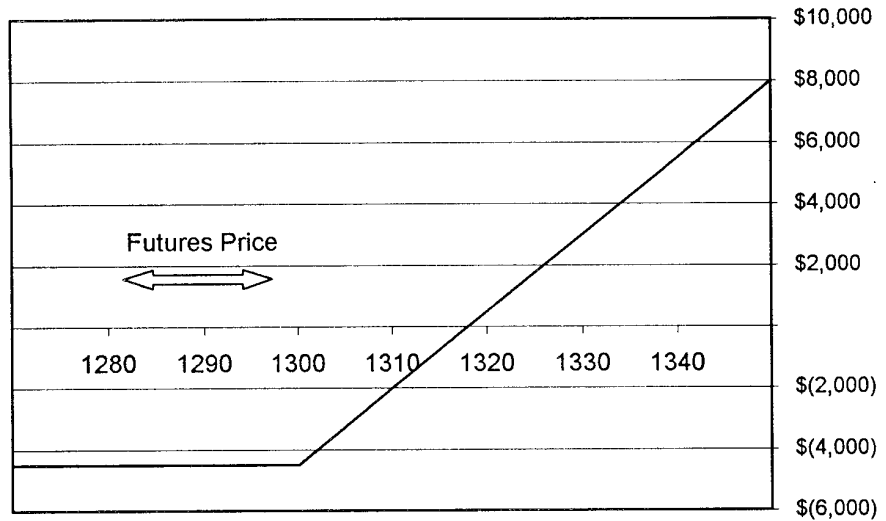
Upside Breakeven Point = 1318.00 (strike + premium paid =
 $1300 + 18.00 = 1318$)

Potential Profit = Virtually unlimited

Additional Considerations

The trader who is long at-the-money calls expects the market to rally above the breakeven point and to do so within the 2-3 month time horizon. An increase in volatility along with upside action would be another positive for the position. Time decay, decreasing volatility or a weaker than expected rally will adversely affect the position. Below is a profit/loss diagram (at expiration) of this position.

Long S&P 500 Dec 1300 Call



Profiting From a Falling Market — Buying Put Options on S&P 500 Futures

Scenario

It's mid-March, and after a strong advance, you believe the S&P 500 will decline for the next several months.

You go long the June 1320 put (being an out-of-the-money option, the premium will be less than an at-the-money option) at a cost of 10.00 points (\$2,500).

Specifics

SPH: 1350.00

June 1320 put option 10.00 points

Outlook on market & volatility: Bearish

Risk/Reward Character of Position

Maximum Risk = Limited to the premium paid (10.00 points or \$2,500)

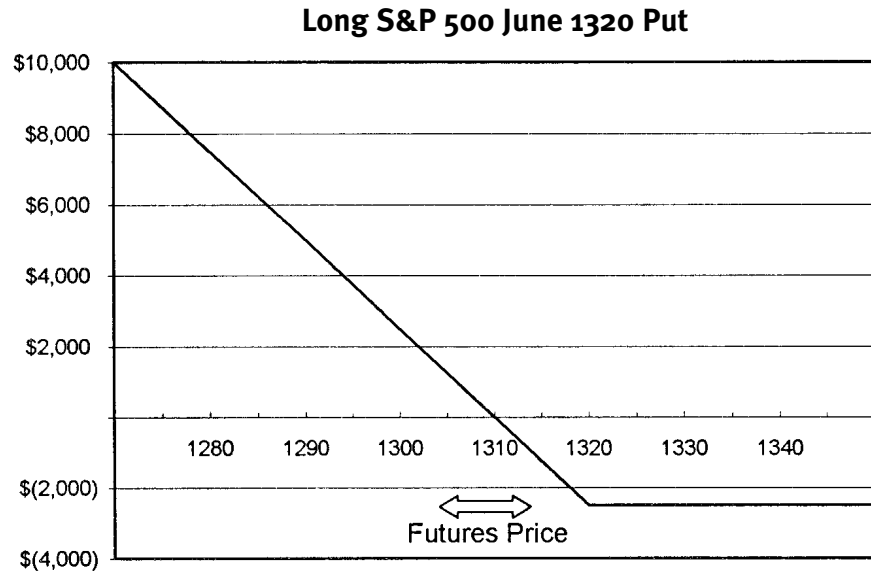
Point of Maximum Risk = Futures at 1320 or higher

Downside Breakeven Point = 1310 (Strike – premium paid = 1320 - 10.00 = 1310)

Potential Profit = Virtually unlimited as futures decline further

Additional Considerations

As with all long option positions, the trader hopes volatility increases as prices drop. Time decay also will adversely impact this position if the decline takes too long to manifest itself.



Using Put and Call Options in Conjunction with Futures Positions

Buying put options in conjunction with a long futures position can set limits to the potential loss or lock in profits from an already profitable futures position. The purchase of a put guarantees, in effect, a selling price for the long S&P 500 futures position. The long put provides insurance against a drop in the stock market and lower S&P 500 futures prices, thereby placing limits on the loss that might occur from the long futures position alone. The decision concerning which put option (i.e., strike price and expiration month) to buy depends on the amount of capital available and your tolerance for risk, as well as your outlook on the market and volatility.

Call options can also be purchased either to lock in the profit or limit the loss on a short S&P 500 futures position. The call serves as insurance against an upside move. In a very similar fashion, a long call can be used to limit the loss on a newly placed short futures position. Using calls and puts in this fashion accomplishes much the same as a stop loss order and is more evidence of the flexible nature of options strategies.

Writing Call and Put Options

Profiting from a Stable or Declining Market

The writer (seller) of an S&P 500 call option receives payment (the premium) from the buyer of the option in return for the obligation of taking a short position in the futures contract at the exercise price if the option is exercised. (Actually, when an option is exercised, an option writer is randomly chosen and “assigned” to take the short futures position.) The call writer’s risk is unlimited, while the call buyer’s risk is limited; and the call writer’s profits are limited, while the call buyer’s profits are unlimited. Note that an option writer can buy in the contract at any time before expiration or assignment to liquidate the obligation. Be sure you understand and can bear the risk involved in writing uncovered call options.⁵

The principal reason you write call options is to earn the premium. In periods of stable or declining markets, call writing can mean an attractive cash flow from a relatively small capital investment. You hope that, at expiration, the settlement price of the futures contract will be at or below the exercise price of the option. The option will then expire worthless—and you keep the entire premium.

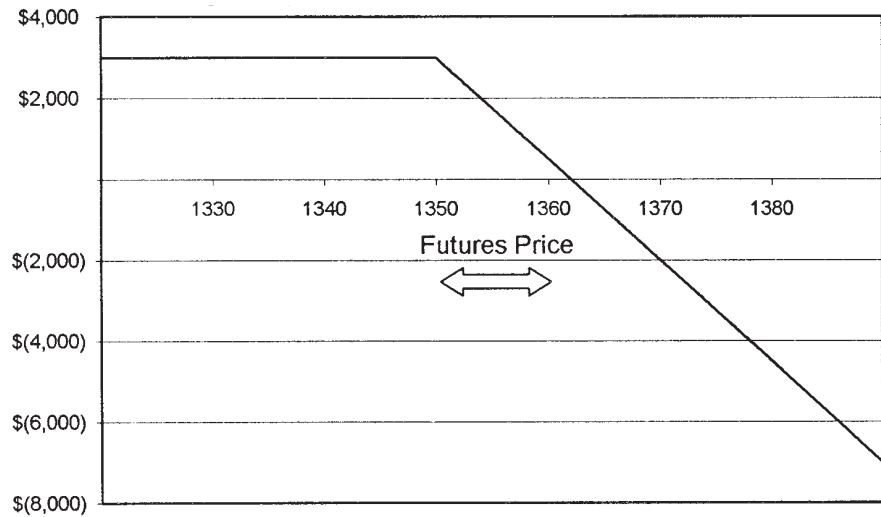
Suppose you expect a decline in the stock market and sell an S&P 500 December 1350 call for 12.00 points, or \$3,000. At expiration in December, the S&P 500 Index is quoted at 1340.00. The S&P 500 December 1350 call would then expire worthless; you retain the entire premium amount of \$3,000.

On the other hand, if you hold the short call option position and the futures price at expiration is above exercise price, you will forfeit the in-the-money amount. This will result in the loss of at least a portion of the premium and in the case of a stronger advance, possibly more than the premium taken in.

If the Special Opening Quotation or “SOQ” (calculated to determine the final settlement of the quarterly S&P 500 futures contract) is at 1351.00, you would forfeit 1.00 point, or \$250 (futures price settlement of 1351 minus the exercise price of 1350.00). Your profit would then be reduced to \$2,750 (original premium of \$3,000 minus the in-the-money amount of \$250). If the index settles per the SOQ at 1362.00, you would essentially break even; the option would be worth what you sold it for and no profit or loss would result. If the index settled at any price above 1362.00, a loss would result. This loss would equal the intrinsic value of the option at expiration minus the original premium taken in. See the profit loss diagram on the next page for this short option position.

⁵ Call writers must post a performance bond to maintain their positions and may be required to meet performance bond requirements.

Short S&P 500 December 1350 Call



The call option writer should keep in mind that he may be assigned at any time during the life of the option. Exercise becomes more likely if an option has a large intrinsic value and little time value. If a call has gone deeply in-the-money, and if the writer does not wish to take a futures position, he should consider buying back the call.

Profiting from a Stable or Rising Market

The primary motivation for writing put options is, again, to earn the premium. Like the call writer, the put writer is subject to substantial risk in return for earning the premium.⁶

The writer of an S&P 500 put option is obligated to take a long S&P 500 futures position if he is assigned for exercise. The put writer hopes that the futures price will be at or above the put's exercise price at expiration. The put option would then expire worthless, and the writer would keep the entire premium received for the sale of the put. The risk is that the S&P 500 futures price will fall below the exercise price of the put option by an amount exceeding the premium received for the sale of the put option.

Again, as a put writer you should understand that the option may be exercised by the put holder at any time during the life of the option. Monitor in-the-money puts carefully if you do not wish to take a long futures position.

⁶ Put writers must post a performance bond to maintain their positions and may be required to meet performance bond calls. As in the case of writing calls, writing puts should be undertaken only by those investors able to bear the risk.

Income and Limited Protection

Writing a call option against a long futures position is a strategy that can produce an attractive return over the margin required if the stock market stabilizes or rises only slowly. The long futures protects the short call in a rising market to assure that the writer keeps the premium received (less intrinsic value if the call is sold in-the-money). If an out-of-the-money call is sold and the futures price rises, but not through the strike, the premium plus the futures gain will both be profit at expiration.

The premium also gives limited protection against a drop in the futures price. The risk is that the futures price might decline by more than the premium received, and the investor may experience a net loss.

A strategy of writing a put against a short S&P 500 futures position can similarly suit the expectation of a stable or slowly declining market. The risk in the combination of short S&P put, short S&P futures is that the futures price may rise by an amount greater than the premium received — causing a loss equal to that of having a short futures position less the premium.

Spreads and Combinations Using Options

Earlier we spoke of the tremendous flexibility that put and call options allow. With the myriad of strike prices and expirations months, there is literally no limit to the number of combinations and spreads that can be “tailor-made” according to the trader’s opinion. For example, if a trader thought that the market was going to have a large move (or an increase in volatility) but didn’t want to be concerned about correctly forecasting the direction, he could employ a strategy commonly known as a straddle. In a straddle, the strategist usually combines the purchase of an at-the-money call with the purchase of an at-the-money put. You’ll find examples of how to construct a straddle and a profit/loss diagram summarizing how such a position would perform under different scenarios on the next page.

Scenario

It is just before the new year and you think that the market will have an explosive move since it has been consolidating for most of the last 8 months. Volatility has been near the low end of its range. You decide to purchase an S&P 500 March (in this case March 2000) 1400 straddle.

Specifics

SPH:	1400.00
March 1400 call option:	25.00 points. (25.00 x \$250/pt. = \$6,250)
March 1400 put option:	25.00 points. (25.00 x \$250/pt. = \$6,250)
Total Cost of Straddle:	50.00 points. (or \$12,500)

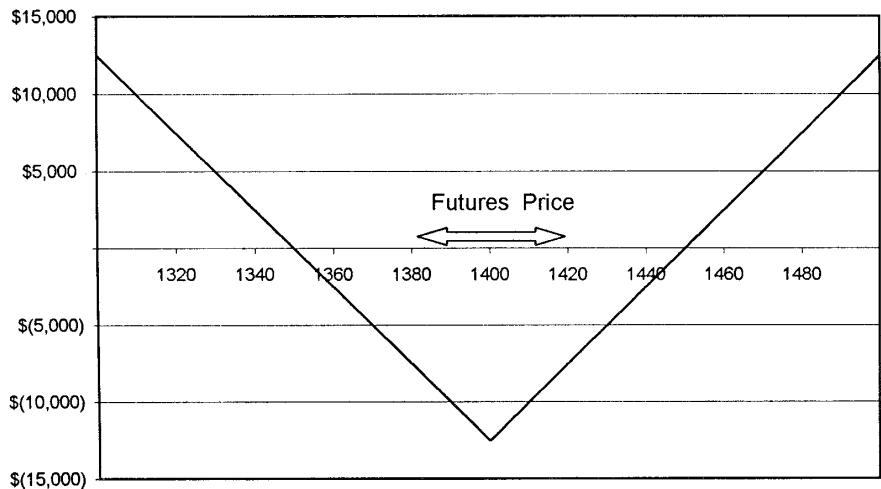
Risk Reward Character

Maximum Risk:	= Limited to premium paid: 50.00 points or \$12,500
Point of Maximum Risk	= Occurs with futures at 1400
Upside Breakeven	= Strike price + total premium = 1450 (1400 + 50.00)
Downside Breakeven	= Strike price – total premium = 1350 (1400 – 50.00)
Potential Profit	= Virtually unlimited in both directions

Additional Considerations

The trader doesn't care if the market goes up or down, but is only concerned with the degree of the move. Decreasing volatility and the passage of time are especially harmful to a straddle as the strategy requires significantly more premium outlay than the purchase of a put-only or call-only strategy.

S&P 500 March 1400 Straddle



Options as a Hedging Tool

In the earlier section on hedging with futures, we used an example of a \$4 million portfolio requiring the sale of 14 futures contracts for protection against an adverse downward move. Alternatively, you could hedge using options. By buying 14 put options, you could insure against a large decrease in the value of the portfolio, while at the same time, maintain your potential for profit if the market were to rise. The purchase of puts as a hedge works just like insurance. You simply buy the number of puts dictated by the short futures hedge ratio calculation. The degree of coverage would be determined by the choice of the strike price. Higher strike puts would be more expensive than lower strike price puts; however, the protective feature of higher strike puts would “kick in” faster, (much like low insurance deductibles mean higher premiums, but coverage “kicks in” faster). This is because higher strike puts have larger deltas and are more sensitive to declines than lower strike puts with smaller deltas. (With call options, lower strikes have larger deltas and are thus more sensitive than higher strike calls.) For example, buying a put with a strike price of 1290 would protect you as the market declined below 1290. A put with a strike price of 1320 would protect your portfolio 30 S&P 500 points sooner (although at a higher cost). The hedger therefore is faced with deciding how much protection he/she wants and at what cost.

Options can also be used as an “anticipatory hedge”. A money manager might find this hedging strategy very useful. Consider, for example, a manager who expects heavy inflows of cash in the near future, and at the same time expects the market to advance substantially. The manager doesn’t want to miss the rising market, since by the time the cash inflows are received the market may be much higher. He or she could purchase call options (as an alternative to going long futures) for a relatively small sum. Thus, if the market rocketed higher, the money would be invested via the call options. As the cash inflows materialize the manager can invest that money in the market, albeit at higher prices. However, the profits obtained from the call options would offset or lower the effective cost of the investments.

Although this is a hedging strategy, the money manager must monitor the market and position. A market decline or slower-than-expected rise would negatively affect the manager’s long options through time value decay or decreasing volatility. The manager’s maximum risk is only the initial premium paid for the calls. Hence, options offer a cheap, efficient and fast way of becoming invested in the market.

Writing Calls Against the Portfolio

You can sell S&P 500 call options against your portfolio to earn income when you expect a flat market. This is much like the covered writing of individual stock options, except that beta considerations will be important. For a stock portfolio not very well diversified across industry groups, there is risk that the portfolio would not rise enough in a market rally to completely offset losses on the short calls. There is also basis risk which could have some effect if interest rates rise markedly. Finally, performance bonds are required on short options, and while the option losses should be offset by gains in the stock portfolio, performance bond calls would require cash payment.

Using Collars

Collars, also known as fences, risk reversals, cylinders and synthetics, offer portfolio protection at low cost in exchange for foregoing some of the upside profit potential from a market move. These strategies are especially useful for equity portfolio managers who want downside protection but also wish to offset some of the cost associated with purchasing puts as a hedge.

For example, the most common form of collars allows portfolio managers to protect their holdings by combining out-of-the-money call writing with the purchase of put options with a lower exercise price. The proceeds from the sale of the call option will help offset the cost incurred from buying the put. Thus, the net out-of-pocket expense will be less than if the manager had bought put options only. Hence the portfolio manager will gain protection from a stock market decline and pay for it in reduced upside participation.

Example: After a strong rise in the S&P 500, a pension fund manager with a \$35 million portfolio (with a beta of 1.00) decides to lock in some of his gains by hedging with S&P 500 futures options, using collars.

Current S&P 500 cash:	1300.00
Current S&P 500 futures (Mar):	1312.00
S&P Mar 1300 put option premium:	14.00
S&P Mar 1320 call option premium:	15.00

STRATEGY:

Buy 20	S&P Mar 1300 puts @ 14.00
Sell 20	S&P Mar 1320 calls @ 15.00

Net cash credit per position = 1.00

Maximum selling price = strike price of call + net cash credit =
 $1320 + 1.00 = 1321$

The portfolio will forego all gains above 1321.00 (see graph at right).

Minimum selling price = strike price of put + net cash credit =
 $1300 + 1.00 = 1301$

No matter how far below 1300 the S&P 500 declines, the manager's floor price will remain at 1301.00.

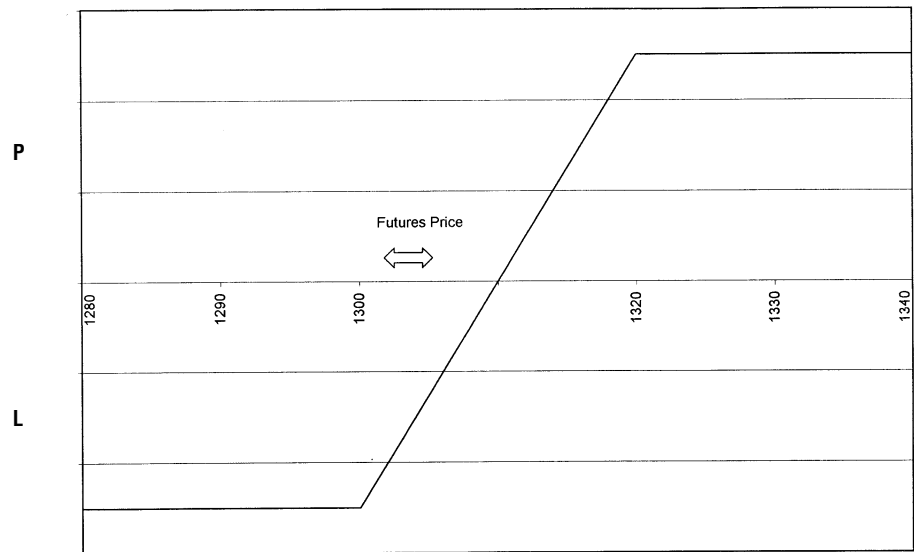
As the previous example illustrates, the fund manager has limited his exposure should the stock market have a significant decline. Moreover, the cost of protection was smaller because the manager offset his put purchase with the sale of out-of-the-money calls. The sale of these calls, however, will limit any upside profits should the manager's forecast be wrong and the market advance beyond 1321.

On the other hand, had the manager hedged with the outright sale of a futures contract at 1312, he or she would have foregone any profits above the 1312 level. Clearly, the combined advantages of downside protection and upside participation make this an attractive strategy for portfolio managers.

Furthermore, the sale of call options may entail additional performance bond liability, a concern somewhat mitigated by the fact that the fund manager owns the underlying cash instrument — a broadbased portfolio of stocks.

Using collars as a form of portfolio hedging gives managers considerable flexibility. In fact, if they choose, they can change their exercise prices and therefore alter their risk-reward profiles to accommodate their particular money management performance targets.

Profit/Loss Diagram of Collar



In this brochure we have outlined several strategies using stock index futures and options. It is beyond the scope of this piece to cover all futures/options strategies. For the trader who wants a deeper coverage of options strategies, including bull and bear spreads, strangles, butterfly spreads and more, see the reading list at the end of this brochure.

Conclusion

S&P 500 futures and options offer investors numerous investing and trading opportunities. Their flexibility and cost-effectiveness allow both individuals and institutions to tailor the appropriate risk and return profile for their specific investment objectives. Although some examples of hedging and arbitrage techniques may appear complex, do not lose sight of the fact that stock index futures and options can simplify trading and investment decisions. In particular, options can be used as a hedging vehicle, but also allow investors to construct strategies that profit in advancing, declining and directionless markets. This paper presents an overview of options trading and several strategies that allow investors to accomplish their goals.

Sources of Additional Information

For more information about S&P 500 futures and options on futures and the important opportunities they provide, contact your broker. Together, you can determine what role these products should play in your investment strategy.

The CME has several other publications available for those interested in stock index futures and options. Copies of the following may be obtained by contacting your broker or the CME:

E-Mini S&P 500® Futures & Options (brochure)

E-Mini Nasdaq 100® Futures (brochure)

How to Get Started Trading CME Index Products (brochure)

Nasdaq 100 Index® Futures and Options (brochure)

U.S. Equity Index Futures and Options (information guide)

CME Futures and Options Strategy Guide (brochure)

CME Futures and Options Strategy Charts (pocket-sized booklet)

“Standard & Poor’s,” “Standard & Poor’s 500,” “S&P,” and “500,” are trademarks of The McGraw-Hill Companies, Inc. and have been licensed for use by the Chicago Mercantile Exchange.

Glossary

Arbitrage	The simultaneous purchase and sale of equivalent securities and futures in order to benefit from an anticipated change in their price relationship.
Ask	The price at which the party is willing to sell. Also called the offer.
At-the-money	An option with an exercise price equal or near to the current underlying futures price.
Basis	The difference between the futures price and the current index value.
Basis Point	One-hundredth (.01) of a full Index point, worth \$2.5.
Beta	The relationship between the movement of an individual stock or a portfolio and that of the overall stock market.
Bear Spread	A spread that is put on with the expectation that the futures price will decline.

Bid	The price at which a party is willing to buy.
Bull Spread	A spread position taken with the expectation that the futures price will rise.
Call Option	An option that gives the holder the right to enter a long futures position at a specific price, and obligates the seller to enter a short futures position at a specific price, if he is assigned for exercise.
Cash Settlement	Applies to the expiration of quarterly index options and futures contracts. There is no delivery of securities, and the full value of the contract is not transferred. Final settlement will occur on the morning following the last day of trading when all open positions will be marked to a Special Opening Quotation based on the component stocks in the S&P 500 Index. Expiring options that are in-the-money based on the Special Opening Quotation will be automatically exercised. This results, in effect, in cash settlement for the in-the-money amount.
CFTC	The Commodity Futures Trading Commission is the independent federal agency created by Congress in 1974 to regulate futures and options trading.
Clearing House	A division of the Chicago Mercantile Exchange through which all trades on the CME are adjusted and cleared.
Covered Writing	The sale of an option against a position in the underlying futures contract.

Credit Spread	A spread in which the value of the option sold exceeds the value of the option purchased.
Debit Spread	A spread in which the value of the option purchased exceeds the value of the option sold.
Delivery	The process by which funds and the physical commodity change hands upon expiration of a futures contract. (See <i>Cash Settlement</i> .)
Delta	A measure of the price-change relationship between an option and the underlying futures.
Exercise Notice	A notice tendered by a brokerage firm to the CME Clearing House that exchanges an option for a futures position.
Exercise Price	The price at which futures positions are established upon the exercise of an option. Also called <i>strike price</i> .
Expiration Date	The last day that an option may be exercised. The expiration date may be different than the last trading day (See <i>Last Trading Day</i> .)
Futures Contract	A standardized, transferable legally binding agreement to make or take delivery of a certain commodity at a specific time in the future. The price is determined by open outcry auction, and is adjusted daily to the current market. (See <i>Mark-to-Market</i> .)

Gamma	The change in an option's delta with respect to a change in the underlying instrument.
Hedge	The limitation of risk in the event that investments do not perform as expected. In the futures context, to hedge is to take a futures position opposite to a position held in the cash market to minimize the risk of financial loss from an adverse price change; a purchase or sale of futures as a temporary substitute for a cash transaction that will occur later.
Index Arbitrage	The purchase or sale of a basket of stocks in conjunction with the sale or purchase of a derivative product, such as index futures, in order to profit from the price discrepancies between the two.
In-the-money	A situation in which the market price of a futures contract is higher than the exercise price of a call, or lower than the exercise price of a put.
Intrinsic Value	That portion of an option's premium that represents the amount an option is in-the-money.
Last Trading Day	For the S&P 500 futures and for the quarterly options, this will be the Thursday prior to the third Friday of the contract month. For the eight interim-month expiration options, this will be the third Friday of this contract month. If that day is a holiday, it will be the preceding business day.

Limit Order	An order in which a customer specifies a price; the order can be executed only if the market reaches or betters that price.
Long Position	Indicates ownership. In futures, the long has purchased the commodity for future delivery. In options, the long has purchased the call or the put option.
Maintenance Performance Bond	A sum, usually smaller than – but part of – the original performance bond, that must be maintained on deposit at all times. If a customer’s equity in any position drops to, or under, the maintenance performance bond level, the broker must issue a performance bond call for the amount of money required to restore the customer’s equity in the account to the original level.
Mark-to-Market	Daily, the CME Clearing House adjusts all open positions to reflect the settlement price of the contract. Each position is credited with profit or charged with loss, and begins the next trading day at the settlement price.
Market Order	An order for immediate execution given to a broker to buy or sell at the best obtainable price.
Offset	Any transaction that liquidates or closes out an open contract position.
Out-of-the-Money	A situation in which the market price of a futures contract is below the exercise price of a call, or above the exercise price of a put.

Performance Bond	Funds that must be deposited with the broker for each futures or written option contract as a guarantee of fulfillment of the contract. Also called <i>margin</i> or <i>security deposit</i> .
Premium	The price of an option agreed upon by the buyer and seller in open, competitive trading on the exchange trading floor.
Program Trading	Program trading is defined as a wide range of portfolio trading strategies involving the purchase or sale of 15 or more stocks having a total market value of \$1 million or more.
Put Option	An option that gives the holder the right to enter a short futures position, and obligates the seller to enter a long futures position at a specific price if he is assigned for exercise.
R-squared	R-squared ranges from 0 to 1.0 and reflects the percentage of a portfolio's movements that are explained by movements in its benchmark index. An R-squared of 1.0 means that all movements of a portfolio are completely explained by movements in the index. An S&P 500 Index Fund, for example, will have an R-squared very close to 1.0.
Settlement Price	A figure determined by the closing range, used to calculate gains and losses in futures market accounts.

Short Position	Indicates obligation. In futures, the short has sold the commodity for future delivery. In options, the short has sold the call or the put, and is obliged to take a futures position if he is assigned for exercise.
SOQ	Special Opening Quotation — quarterly settlement of S&P 500, E-Mini S&P 500, S&P MidCap 400, S&P 500 / Barra Growth & Value, Nasdaq 100, E-Mini Nasdaq 100, and Russell 2000 Index futures and options are based on a Special Opening Quotation of the relevant stocks in the underlying index.
Spot Price	The current market price of the actual stock index. Also called <i>cash price</i> .
Spread	Holding a long and a short position in two related contracts, with the object of capturing profit from a changing price relationship. The term also refers to the price difference between the contracts.
Stop Order	An order to buy or sell at the market when a definite price is reached, either above or below the price that prevailed when the order was given.
Straddle	The purchase or sale of both a put and a call having the same exercise price and expiration date.

Theta	Theta measures the amount of time decay per day in an option.
Time Value	That portion of an option's premium that represents the amount in excess of the intrinsic value.
Uncovered Sale	The sale of an option without a position in the underlying futures contract.
Vega	The change in an options premium with respect to changes in volatility.
Volume	The number of transactions in a contract made during a specified period of time.
Writer	The seller of an option.

The CME OPEN INTERESTS paper series is published by the Chicago Mercantile Exchange (CME) as a reference resource for members of the brokerage community and for institutional and corporate users of financial futures and options. Inquiries should be directed to the Chicago Mercantile Exchange, Marketing Division, 30 South Wacker Drive, Chicago, Illinois 60606-7499. Telephone: (312) 930-8213.

This paper has been compiled for general information purposes only. Although every attempt has been made to ensure the accuracy of the information in this paper, the Chicago Mercantile Exchange assumes no responsibility for any errors, omissions, or changes in the applicable laws and regulations. The opinions expressed herein are those of the author and do not necessarily reflect the opinion of the Chicago Mercantile Exchange. Any examples in this paper are hypothetical fact situations which should not be considered investment advice or the results of market experience. Each investor will have different needs and concerns relating to its futures and options activities and should seek the advice of counsel with respect to those activities. All matters pertaining to rules and specifications herein are made subject to and are superseded by the official, current Chicago Mercantile Exchange Rules. A disclosure statement regarding the risks of trading futures or options may be required to be furnished to an entity trading futures or options by its broker. "Chicago Mercantile Exchange" and "CME" are registered trademarks.

