

---

# Adding Value with Equity Derivatives: Part II

Joanne M. Hill  
*Vice President*  
*Goldman, Sachs & Company*

Futures and index options provide a way to participate in international equities markets at relatively low cost. The choice among option strategies depends on the investment objective. In general, futures are used to provide equity exposure to a particular country market, and index options are used to manage risk.

This presentation covers global applications of equity derivatives. I will discuss specifically the use of futures for managing equity exposure, what is available, and how it is done. I will also review some basic hedging and risk management applications, illustrated by case studies involving asset allocation and active management.

---

## Futures Trading

Futures are attractive because they can be used to achieve the economic equivalent of equity exposure. Investors can use both stock index futures and equity index swaps to gain exposure to most international equity markets. Thus, the three ways of owning an index fund are:

- buy the index and receive the dividends and capital gains (or losses);
- buy the futures contract and invest the body of the notional amount in a cash equivalent with the same expiration date or close to the same term as the futures contract and receive interest income on the cash-equivalent investment and the capital gains from the futures contract;
- buy the swap, receive the interest income on the reset dates and the total return on the index (that is, the capital gain plus dividends, although if so specified in the contract, the dividend payment is netted out of the interest rate payment).

These equivalencies establish what swap rates should be and what futures prices should be at all times. The basic premises are that an investor is

indifferent between buying stocks and futures when the futures premium is equal to the difference between the interest rate and the dividend yield, times the index, and the investor is indifferent between buying stocks and entering into a swap when interest income is equal to the fixed- or floating-rate payment. If those rates differ from the equivalency-set rate, then arbitrage transactions occur. The cost and ease of conducting the arbitrage and the likelihood of markets being open when needed determine the point at which arbitrage takes place and how close the three alternatives track each another.

The primary difference between a futures contract and a swap is that, with the future, the transactor manages the rolling process for expiring futures contracts during the equity exposure, and with a swap, the dealer or counterparty manages the rolling process. When the futures contract expires, the transactor must sell that contract and buy the next term's contract. That process introduces a risk-reward trade-off in the calendar spread, or the cost of rolling. This risk-reward trade-off is imbedded in the pricing of the swap. The dealer will assess where the spread is likely to trade for rolling positions and price the swap accordingly. Some people think futures are more flexible than swaps for positions with high turnover, because the transactor is in the driver's seat in terms of rolling positions and adjusting the amount created in equity exposure.

One of the primary ways derivatives add value is through the savings in transaction costs. **Table 1** lists some estimated round-trip transaction costs in selected markets as of November 1992. The round-trip costs do not include custody and settlement fees, and market-impact costs are estimated by the trader. Transaction costs vary by market. Derivatives,

**Table 1. Estimated Round-Trip Transaction Costs as Percentages of Amounts Invested**

| Cost   | United States | Japan   | United Kingdom | France   | Germany  |
|--|---------------|---------|----------------|----------|----------|
| <i>Stocks</i>                                    |               |         |                |          |          |
| Commissions                                      | 0.14%         | 0.20%   | 0.20%          | 0.10%    | 0.10%    |
| Market impact <sup>a</sup>                       | 0.55          | 0.70    | 0.90           | 0.55     | 0.50     |
| Taxes  | 0.00          | 0.30    | 0.50           | 0.00     | 0.00     |
| Total  | 0.69%         | 1.20%   | 1.60%          | 0.65%    | 0.60%    |
| Average stock price in U.S. dollars <sup>b</sup> | \$39.10       | \$27.30 | \$7.73         | \$158.60 | \$385.65 |
| <i>Futures<sup>c</sup></i>                       |               |         |                |          |          |
| Commissions                                      | 0.01%         | 0.06%   | 0.02%          | 0.04%    | 0.03%    |
| Market impact <sup>a</sup>                       | 0.05          | 0.05    | 0.10           | 0.10     | 0.05     |
| Taxes  | 0.00          | 0.00    | 0.00           | 0.00     | 0.00     |
| Total  | 0.06%         | 0.11%   | 0.12%          | 0.14%    | 0.08%    |

Source: Goldman Sachs.

Note: Statistics are representative of a \$25 million, capitalization-weighted, indexed portfolio executed as agent; does not include settlement and custody fees.

<sup>a</sup>Trader estimate.

<sup>b</sup>Local indexes: S&P 500, Nikkei 225, FTSE 100, CAC-40, and DAX, respectively.

<sup>c</sup>All contracts are quarterly except for the CAC-40.

therefore, can add more value for applications in higher trading cost markets, such as Japan and the United Kingdom than they do in the lower cost markets such as the United States.

The magnitude of index futures trading in various countries is shown in **Table 2**. Six of the markets are approved by the Commodity Futures Trading Commission for trading by U.S. investors, but U.S. investors can transact in the inaccessible markets by using synthetic futures, combinations of a long call and a short put for a long position (or a short call and long put for a short position) struck at the same strike price. Synthetic futures can be structured to expire close to the expiration of the exchange-traded futures

contract. This strategy involves two OTC options, which are priced off of the futures price with a spread to the dealer for creating the transaction. When these synthetics are included, about 95 percent of the world's market capitalization is covered with futures at this point.

**Figure 1** shows the growth in the average daily dollar volume of various index futures between 1991 and 1992. Although the volumes of some of these contracts appear small relative to activity in the United States and Japan, they must be taken in the context of percentage of the world's capitalization. In Europe, the growth in trading activity from 1992 to 1993 was 50–80 percent. Japan experienced a big drop in futures trading, consistent with the decline in equity trading volume during this period.

For all the countries listed, the equity index futures now trade in dollar volumes that are close to or more than trade in the underlying stock market on an average trading day. To put this volume into perspective, remember that a futures trade is really another form of portfolio trade, or an index trade. The cash market is dominated by individual stock traders or active managers; about 80 percent of the participants trade in individual stocks. In contrast, futures are used most often to facilitate portfolio trades. If traders do a portfolio trade in Europe and quote a charge for that based on the market closing prices, they will hedge that position with futures. They will price the portfolio trade based on where they can establish the hedge in the futures market. Globally, almost all portfolio trading includes looking to the futures market and determining what a futures hedge will cost. That cost will help in pricing the basic transaction.

Another measure of the size of markets is open

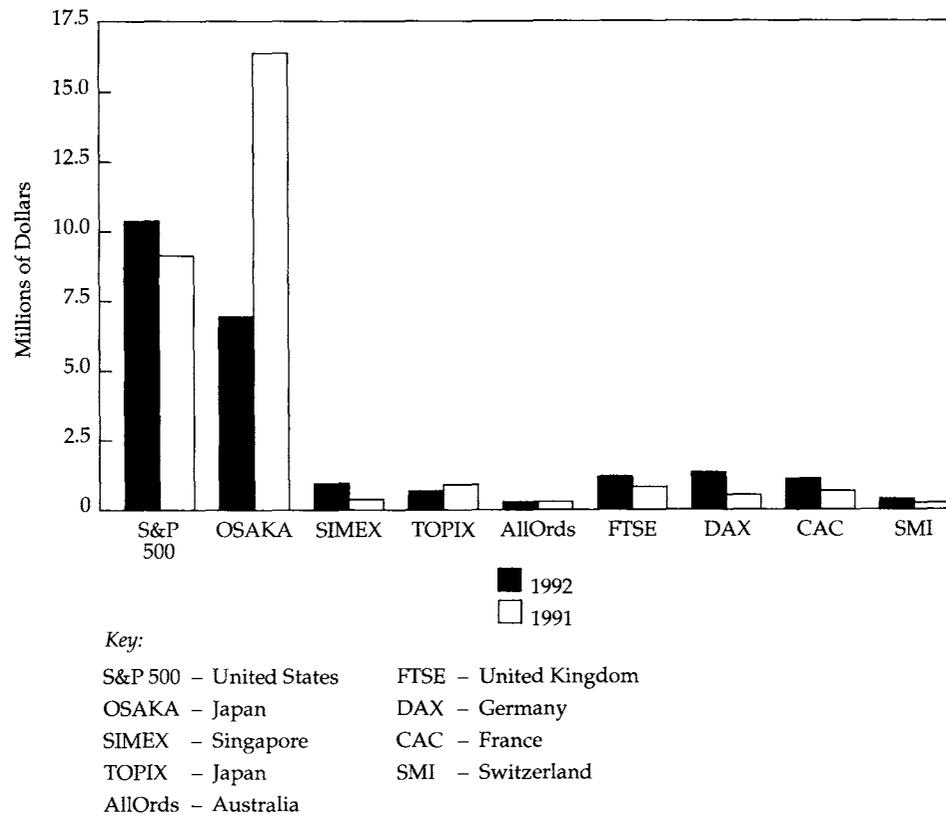
**Table 2. Countries with Stock Index Futures**

| Country                       | Percentage of FT-A World Index |
|-------------------------------|--------------------------------|
| Australia <sup>a</sup>        | 1.3%                           |
| Canada <sup>a</sup>           | 1.8                            |
| Denmark                       | 0.3                            |
| France <sup>a</sup>           | 3.3                            |
| Germany                       | 3.3                            |
| Hong Kong                     | 1.4                            |
| Japan <sup>a</sup>            | 25.4                           |
| Netherlands                   | 1.5                            |
| New Zealand                   | 0.1                            |
| Spain                         | 0.9                            |
| Sweden                        | 0.7                            |
| Switzerland                   | 2.0                            |
| United Kingdom <sup>a</sup>   | 10.5                           |
| United States <sup>a</sup>    | 42.8                           |
| Total as of December 31, 1992 | 95.3%                          |

Sources: Commodity Futures Trading Commission and FT-Actuaries World Markets Monthly.

<sup>a</sup>Approved for use by U.S. investors.

**Figure 1. Average Daily U.S. Dollar Volume for Index Futures around the World**

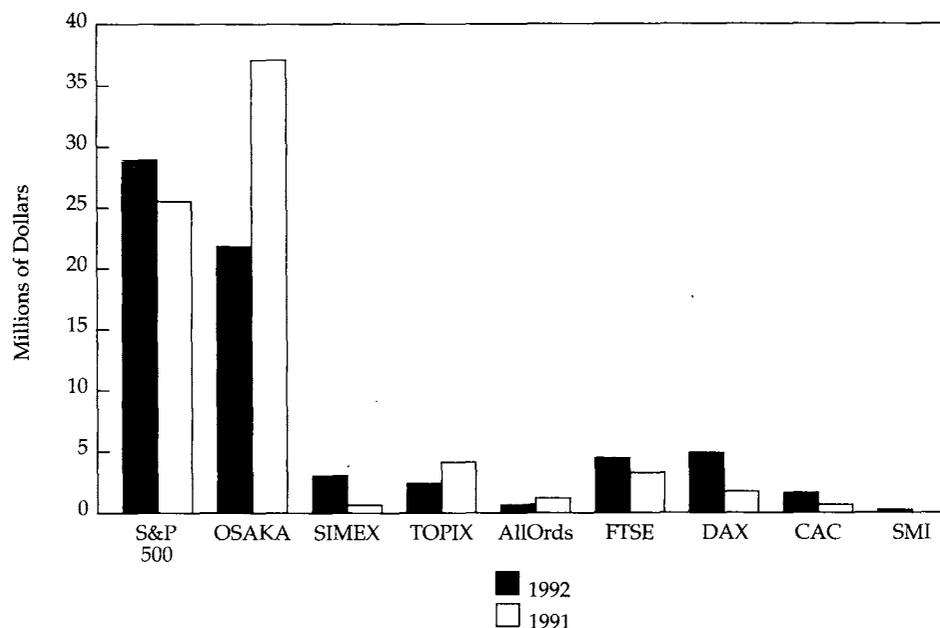


Source: Goldman Sachs.

interest. **Figure 2** shows the growth in open interest volume for index futures between 1991 and 1992.

Most institutions establish maximum trading position guidelines relative to open interest. These com-

**Figure 2. Average Daily U.S. Dollar Open Interest Volume for Index Futures around the World**



Source: Goldman Sachs.

Note: Please see Figure 1 for key to exchanges.

panies do not want to try to trade too large a portion of the open interest because, when they need to roll their positions, the liquidity may not be sufficient.

## Enhanced Index Strategies

Enhanced index strategies combine index futures (or swaps) with cash management or structured fixed-income products to earn incremental return over the index. With futures trading on global stock indexes and government bond markets, an exposure can be easily created that participates in upside or downside moves in the underlying security or index. The funds in excess of initial margin can be invested in cash-enhanced strategies to add an alpha to the underlying index return. Some of the incremental return can be compensation for taking on credit risk. Any cheapness in the futures would be an added benefit to long-exposure strategies.

Because the futures trader has control of the notional value, many traders like the flexibility of denominating that notional value in a chosen currency. They can be long Chicago Mercantile Exchange/Nikkei 225 futures, which have their gains and losses in dollars, invest in Eurodollar deposits, and have the yen risk hedged without any explicit currency transaction. Index futures gains and losses are denominated in local currencies (with the exception of the CME/Nikkei and CME/FTSE contracts). Currency hedging must be done dynamically based on realized gains and losses if the investor wishes to have a fully hedged position.

Using these strategies, investors can separate the management of the currency risk from the equity exposure. In managing equity exposure, the investor can try to add value within that notional amount by such strategies as trading at the high end of the risk spectrum, using long-and-short strategies, volatility trading, and taking on credit risk. These strategies add value through transaction cost savings, returning more than the T-bill rate by taking on some additional risk, and taking advantage of the cheapness or richness of a futures or swap price. This opportunity varies over time and among markets. The S&P 500 Index and CAC-40 Index are the most efficient in tracking fair value. The Nikkei 225 Index and the German and Swiss indexes have deviated from fair value in recent years. An investor positioned on the other side of that demand for liquidity has an opportunity to buy cheap or sell rich.

The five basic reasons for misvaluation of index futures are as follows:

■ *Stock borrowing costs.* The availability of borrowing—a stock loan—is important in the extent to which futures track fair value. If investors cannot

short stocks in the local market (find shares to borrow to sell to others), they will use futures to execute a short position. This practice biases futures toward trading cheap. For example, when index futures began trading in Germany, it did not have a well-developed stock-borrowing market, so futures were consistently cheap. The degree of cheapness has declined, however, because the availability of loans on German stocks has improved.

■ *Dividend treatment.* The main reasons for the mispricing of German futures are the dividend treatment for different entities operating in that market and the cost of difficulty in borrowing stocks. In a period of heavy dividend paying for German stocks, futures are cheap.

■ *Taxes and commissions.* The tax status of dividends and transaction taxes varies across countries and influences the price of futures relative to stock.

■ *Convergence.* Some index futures (U.S., Japan, Germany, France) allow for trading at the contracts' settlement price, while other contracts (U.K., Hong Kong) have less convergence because the settlement price is based on an average of prices over a time interval.

■ *Demand for liquidity when a major market trend emerges.* Because futures offer a central market to trade aggregate equity exposure, they often feel the most pressure when new information or an imbalance of market views concentrates buying or selling pressure. This concentration may make the futures appear mispriced relative to the (less accessible) underlying stock market.

Four other issues should be considered in assessing the usefulness and risks of index futures: how well the index tracks its benchmark, liquidity, nearby futures mispricing, and calendar spread mispricing.

## Tracking

One consideration is potential return differences between the futures and the local index. Most institutions manage a benchmark or active portfolio. Tracking their benchmark against the local index underlying a futures contract informs them of the range of under- and overperformance. The range can be calculated statistically with regression techniques available through firms such as BARRA or Vestek. Tracking errors can be positive or negative and should balance out over long performance periods.

Some of the measures used to assess how well an index derivative matches a portfolio are correlation and analyses of annualized tracking error, the number of issues in common, and market capitalizations in common. **Table 3** shows tracking error statistics versus benchmarks for several countries with index futures markets, along with some volume informa-

**Table 3. Countries with Stock Index Futures Contracts and Hedgable OTC Options and Index Swap Markets**

| Country <sup>a</sup> | Futures Index       | Stocks in Index | 1993 Average Daily Volume (US\$ Million) | Tracking Error vs. FT-AWI | Tracking Error vs. MSCI |
|----------------------|---------------------|-----------------|--|---------------------------|-------------------------|
| Australia            | All ordinary shares | 274             | 181                                      | 2.2%                      | 3.1%                    |
| Canada               | TSE 35              | 35              | 27                                       | 3.2                       | NA                      |
| France               | CAC-40              | 40              | 1,302                                    | 1.9                       | 1.9                     |
| Germany              | DAX 30              | 30              | 1,287                                    | 1.8                       | 2.2                     |
| Hong Kong            | Hang Seng           | 33              | 300                                      | 2.5                       | 1.8                     |
| Japan                | Nikkei 225          | 225             | 8,032                                    | 6.9                       | 7.1                     |
|                      | TOPIX               | 1,229           | 977                                      | 2.3                       | 3.1                     |
| Netherlands          | EOE                 | 25              | 81                                       | 5.5                       | 6.8                     |
| Spain                | IBEX35              | 35              | 62                                       | 1.9                       | 3.3                     |
| Sweden               | OMX                 | 30              | 25                                       | 2.7                       | NA                      |
| Switzerland          | SMI                 | 23              | 229                                      | 1.8                       | 4.2                     |
| United Kingdom       | FTSE 100            | 100             | 1,210                                    | 1.0                       | 1.3                     |

Sources: Goldman Sachs and BARRA Country Models of Global Equity Models.

Notes: NA = Not available. In addition to the country indexes, there is limited trading in a European index called "Eurotop 100," which lists futures contracts on the COMEX in New York. All indexes are market capitalization weighted except for the Nikkei 225, which is price weighted, and the EOE, which is close to equal dollar weighted.

tion for the first five months of 1993. The benchmark indexes most widely used for international markets are those maintained by FT-Actuaries (FT-A) and Morgan Stanley Capital International. Tracking error is quoted in annualized standard deviation units: for example, with a 2.3 percent tracking error of TOPIX to the FT-A Japan Index, we would expect the TOPIX return to be within 2.3 percent of the return of the FT-A Japan in approximately two years out of three. Most indexes on which global index futures are based have tracking error of 1–4 percent with benchmark indexes.

This type of analysis comparing portfolio to local futures indexes can be done for all the major markets. Table 3 shows the tracking of the local indexes in several countries to the two leading international benchmark indexes, the MSCI EAFE and the FT-A Europe.

### Liquidity

Liquidity is the ability to execute an order within an expected time frame. One measure of index futures liquidity is futures volume in relation to the stock volume in a given time period. When investors want to adjust a long or short exposure, they want to implement it in the market with the best liquidity for that type of trade. Because the futures market is by definition a centralized place for exchanging index exposure, in most countries, it has the greatest liquidity.

### Nearby Futures Mispricing

The potential for adverse pricing of futures relative to a benchmark is another consideration. One

way to measure this mispricing is the percentage deviation from fair value for nearby futures contracts. Figure 3 shows the average percentage deviation from fair value for global nearby futures contracts in 1991 and 1992. Mispricing has been declining over time for most index futures markets. The Japanese index futures market, for example, which was persistently trading rich, has moved closer to fair value, and the German index futures have moved closer to fair value from persistent cheapness.

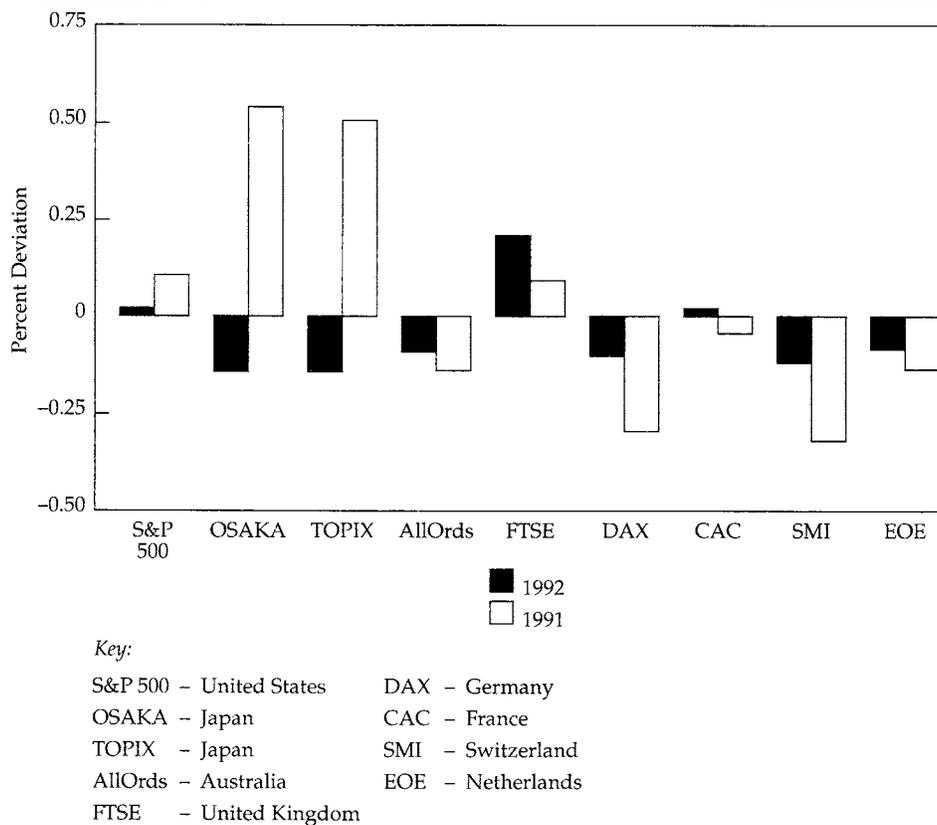
### Calendar Spread Mispricing

The potential for added costs from rolling positions at levels that deviate from fair value is another consideration. Figure 4 shows the percentage deviation from fair value for different calendar spreads in 1991 and 1992. Here also, the cheap German market has moved closer to fair value but continues to trade most cheaply in the period in which dividends are not concentrated. In the United Kingdom, a great many investors are using FTSE futures as a surrogate for index exposures (in part because the cost of stock transactions in the United Kingdom is high compared with futures). That market generally trades slightly rich. In general, the factors affecting calendar spread pricing are very similar to those in overall futures valuation.

### Rolling Futures Positions

Derivatives users can stay in derivatives by rolling their futures positions; or they can move into stocks one by one (as the futures are unwinding); or they can use an EFP (exchange for physical)—an exchange of futures for the portfolio, which is a portfo-

**Figure 3. Percentage Calendar Spread Deviation from Fair Value for Global Nearby Futures Contracts**



Source: Goldman Sachs.

lio that closely tracks the futures—to move from futures to stocks. An EFP is permitted on futures exchanges when official trading hours are over; the price is negotiated between the buyer and seller. EFPs can be done in most global markets, and the dealers will quote a cost for moving futures into the portfolio. No one of the three strategies dominates the other two.

The advantages of replicating index exposure with futures are low commissions, little market impact, and no disruption of the portfolio. On the negative side, futures may become inefficient for maintaining equity exposure during long periods because commissions, market impact, and rollover risk are incurred as one expiring contract is replaced by another. By monitoring the rate of open interest decay and net demand for long- or short-roll trades, an investor can increase return in managing the roll. The near contract goes away, and the next one gradually builds up open interest.

The advantages of moving futures into stocks one by one are low initial cost to obtain market exposure and ability to assemble portfolios carefully without time pressure. The disadvantage is that the

manager still incurs the bid-ask spread of trading individual stocks.

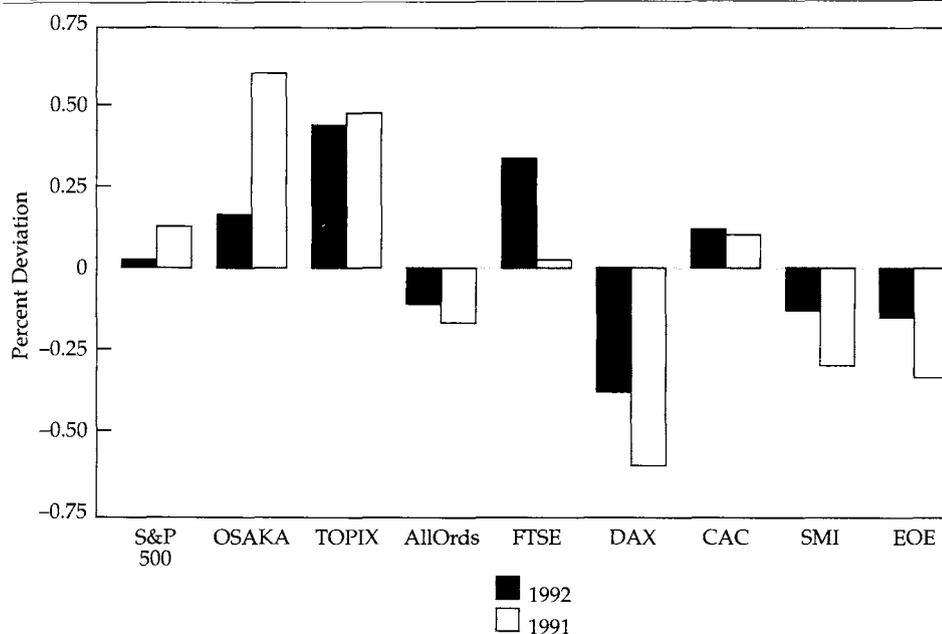
Moving into stocks through an EFP creates less market impact than trading individual stocks and also involves low initial cost to obtain market exposure. The disadvantages of this approach are that the manager must trade the portfolio at once rather than spread it over time and that transaction costs are higher than rolling futures.

### Alternative Cash-Equivalent Strategies

Cash held in synthetic index funds can be invested in short-term securities or other market-neutral strategies. Some of the cash-equivalent strategies people use are as follows:

- *T-bills*. Safest investment but also lowest returns.
- *Money market fund*. Best liquidity; returns depend on credit risk and average maturity.
- *Eurodollar certificates of deposit*. Highest money market returns; good liquidity; closest to rate implied in futures or swaps because they represent base for dealer funds cost.

**Figure 4. Percentage Deviation from Fair Value for Different Calendar Spreads**



Source: Goldman Sachs.

Note: Please see Figure 3 for key to exchanges.

■ *Mortgage- or other asset-backed securities.* Floating-rate paper backed by pools of mortgages or other collateral; returns depend on credit spreads, prepayment characteristics, and defaults within pool; low liquidity.

■ *Market-neutral strategies.* Hedged positions in stocks, equity indexes, or fixed-income securities; basis risk of hedge; low liquidity.

## Hedging with Index Options

An investor can use listed or OTC options on a standardized index or a customized portfolio to manage equity market risk without removing all equity exposure. Hedging with index options is appropriate for managers who want some equity exposure but do not want full equity risk. A hedging or index options program can be designed to provide asymmetric participation in the upside or the downside, where futures are just the equivalent of owning a portfolio. To implement an index options program successfully, the investor must choose an options strategy, decide on a time horizon, compare listed and OTC options, and choose an index. **Table 4** lists some index options available in the U.S. market.

OTC options are privately negotiated options contracts between two parties who agree on the underlying stock portfolio or index as well as on the strike price, expiration, and exercise style. In choosing between listed and OTC options, the standardization of the listed options, settlement, and clearing are issues. If the arrangement is something straight-

forward and the strike prices come at fairly tight intervals, most people prefer the liquidity of the listed market. For a long-term objective, such as overperformance relative to a benchmark, they must go to the OTC market, which has more flexibility but less liquidity for transactions of small to moderate size. The major differences between the listed and OTC markets are as follows:

■ *Maturities.* Listed options typically have shorter maturities than OTC options, although some longer dated options exist. OTC options can vary between one month and five years.

■ *Trading procedures.* For listed options, each exchange has its own operating procedures (e.g., market maker or specialist). OTC options are traded in dealer markets with traders at major investment and commercial banks quoting bid and offer prices by phone.

■ *Settlement.* Each exchange with listed options has its own settlement and clearing procedures, whereas settlement of OTC options is negotiated by buyout terms in a contract entered into by the counterparties.

■ *Underlying assets.* Listed options are traded on individual stocks, major stock indexes, and selected industry groups. OTC options can be based on any stocks, industry portfolios of stocks, and indexes (domestic or international). They can also be based on the relative value of two stocks or stock portfolios.

■ *Exercise.* Most listed options can be exercised at any time (American), but some only at expi-

**Table 4. Listed Index Options**

| Symbol | Index            | Exchanges <sup>a</sup> | Long-Dated | Short-Dated |
|--------|------------------|------------------------|------------|-------------|
| SPX    | S&P 500          | CBOE                   | X          | X           |
| OEX    | S&P 100          | CBOE                   |            | X           |
| VLE    | Value Line       | PHLX                   | X          | X           |
| NYA    | NYSE Composite   | NYSE                   |            | X           |
| XMI    | XMI Major Market | AMEX                   |            | X           |
| JPN    | Japan            | AMEX                   | X          | X           |
| MID    | S&P MidCap       | AMEX                   |            | X           |
| FSX    | FTSE 100 Share   | MERC                   |            | X           |
| EUR    | Eurotop 100      | AMEX                   |            | X           |
| WSX    | Wilshire 250     | PSE                    |            | X           |
| RUT    | Russell 2000     | CBOE                   |            | X           |
| XOC    | OTC              | PHLX                   |            | X           |

Source: Goldman Sachs.

<sup>a</sup>AMEX = American Stock Exchange  
 CBOE = Chicago Board of Trade Options Exchange  
 MERC = Chicago Mercantile Exchange  
 NYSE = New York Stock Exchange  
 PHLX = Philadelphia Stock Exchange  
 PSE = Pacific Stock Exchange

ration (European). Settlement of OTC options is negotiated by the counterparties. They can be American or European and can be based on the maximum or average values of the equity during the life of the options. They can also contain "knockout" features; that is, if the asset reaches a certain price before expiration, the option automatically expires.

## Options Applications

A review of some applications of options in the U.S. markets will illustrate how option strategies can be constructed to be consistent with a particular investment objective. In Case A, a portfolio manager wants to reduce S&P 500 exposure with index derivatives and tries to choose among the alternatives. In Case B, a portfolio manager wants short-term upside participation. In this situation, the manager has a lot of cash, does not know what stocks to buy, and uses derivatives to become invested in something closely resembling what the portfolio already holds. In Case C, a portfolio manager wants to benefit from a sector that is over- or underperforming another sector.

### Case A

*Scenario:* Portfolio Manager A has some stocks and is fairly bullish on the S&P 500 for 1993 (expects total returns to be 12 to 15 percent) but is concerned about the risks associated with recent index gains, the risk of very negative reaction to President Clinton's policy in the bond market, and the risk of slipping back into recession. Futures are trading within 20 basis points of fair value, and pricing favors long futures positions by 20 basis points. Index op-

tions are priced to expect a slightly more volatile year in 1993 than 1992, but the prices do not reflect the risk of the sudden 5–10 percent decline the portfolio manager fears.

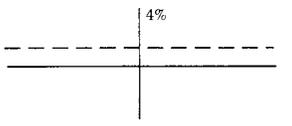
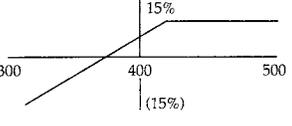
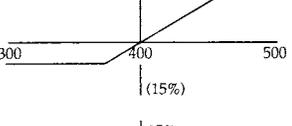
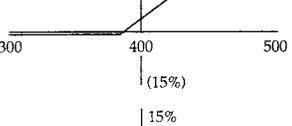
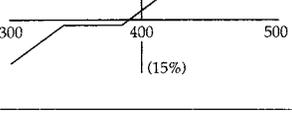
*Discussion:* Some hedging strategies the manager might use and the associated payoff profiles are shown in **Exhibit 1**. Strategies range from selling futures, writing calls, buying puts, using a zero-premium collar (buying a put and selling a call to eliminate any up-front cash investment), and using a zero-premium put spread collar (buying a put but selling a put farther out of the money because the manager is willing to add to the portfolio's equity exposure if the index drops dramatically).

Portfolio Manager A expects a rising market but is worried about the downside risk. I would rule out a zero-premium collar because it limits the upside too much. The zero-premium put spread collar best fits the profile of what a wary portfolio manager might choose to do, because it leaves room for upside in the range of performance the investor expects. The other possibility would be simply buying the put itself. The choice would depend on the pricing of the two strategies.

**Table 5** is an example of how costs affect a manager's decision. When choosing hedging strategies, scenario analysis is important, just as it is for fixed-income investments. Of course, looking at up-front cost will not help with the deltas, gammas, and so forth. It indicates what happens for a marginal change, but it does not indicate what happens in six months, which might be the horizon. In that time, changes are not marginal; they are much larger.

As **Table 5** indicates, buying puts has no upside

### Exhibit 1. Most Common Hedging Strategies

| Strategy                       | Main Feature  | Payoffs   | View   |
|--------------------------------|---|---|--|
| Sell Futures                   | Raising Cash  |   | Downside Risk High<br>Upside Potential Low                                       |
| Writing Calls                  | Compensated for Limiting Upside   |   | Trading Range Likely<br>Downside and Upside Potential Low                        |
| Buying Puts                    | Pay for Limiting Downside Only  |   | Downside Risk High<br>Upside Potential High                                      |
| Zero-Premium Collar            | Full Index Participation within a Range                                     |   | Trading Range Likely<br>Risk of Downside High                                    |
| Zero-Premium Put Spread Collar | Collar with Higher Upside Limit, Restore Index Exposure after Large Decline |  | Expect Rising Market,<br>but Risk of Downside High<br>Would Buy if Large Decline |

Source: Goldman Sachs.

limit. The downside limit, 5 percent out of the money (OTM), including dividend yield, is about -5.85 percent. This strategy will cost about 4 percent of the market appreciation, so if the market goes up by, say, 20 percent, the manager will have earned 16 percent. The collar with the put spread caps the upside at 11.15 percent. The manager's target was 12-15 percent, so this strategy cuts off some of the upside. The manager has a downside limit of -1.70. If the index declines in the range of 1-11 percent, the manager has the floor. The cost is only 15 basis points for a return range of -1.7 to 11 percent. In this case, this strategy looks like the best.

One of the dangers with collar strategies is that the time decay in the OTM put being sold is most concentrated in the last six weeks. Prior to expiration, the payoff profile will look more like a futures payoff and will not have the kink in it nearly as dramatically as shown in Exhibit 1. The different times to expiration are important, as investors hedging with zero-premium collars in 1991 discovered. Suppose they had collars maturing at year-end and wanted to hold those positions to expiration because the calls they were short were going through their periods of maximum time decay to pay for the puts they bought. Then, the Federal Reserve Board eased

**Table 5. Summary Comparison of Option Hedging Strategies**

| Strategy  | Return (Cost) | Return (Cost Range) | Upside Limit | Downside Limit    |
|---|---------------|---------------------|--------------|-------------------|
| Selling futures                                     | 0             |                     | 4.0%         | 4.0%              |
| Selling calls (5% OTM)                              | 3.75%         | <11.25%             | 11.25        | None              |
| Buying puts (5% OTM)                                | (4.00)        | >(5.85)             | None         | (5.85)            |
| Zero-premium collar (5% OTM)                        | (0.25)        | (2.10) to 7.90      | 7.90         | (2.10)            |
| Collar with put spread (call 8% OTM, put 5-15% OTM) | 0.15          | (1.70) to 11.15     | 11.15        | (1.70) to (11.70) |

Source: Goldman Sachs.

in the third week of December, and many investors hit their upside limit on index participation and learned how sensitive collars can be to the time to expiration.

## Case B

*Scenario:* Portfolio Manager B has a 15 percent position in six-month cash equivalents earning 1.67 percent during the next five months. The manager is concerned about not being able to participate in the upside but does not want to buy stocks yet. The manager may be willing to buy upside participation through an index or indexes most similar to the portfolio.

The manager creates a hypothetical portfolio of 50 stocks by taking 26 from a priority-buy list and 24 other medium-sized companies selected from the S&P MidCap Index. The tracking errors for the indexes are 3.5 percent for the S&P 500, 5.83 percent for the S&P MidCap, and 3.06 percent for the Russell 1000. The costs of the index options are shown in **Table 6**. The manager looks at the various call option strategies at different degrees OTM and chooses a strike that is 2.46 percent OTM, which would be the cost of the upside participation for five months. The MidCap would cost more because it is a more volatile index.

**Table 6. Index Option Costs**  
(monthly percentages)

| Strike       | S&P 500 | S&P MidCap |
|--------------|---------|------------|
| At the money | 3.30%   | 4.04%      |
| +2%          | 2.18    | 2.95       |
| +4%          | 1.40    | 1.94       |
| +6%          | 0.76    | 1.24       |

*Source:* Goldman Sachs.

*Discussion:* The manager decides to construct a portfolio that is about 84 percent S&P 500 and 16 percent S&P MidCap. It has a tracking error of 3.15 percent to the portfolio of stocks that this manager would want to hold if she or he could go in and buy them. The manager is purchasing 2 percent OTM calls. The delta is 0.42, or about 42 percent of the participation today. The cost is 2.33 percent; net of the interest earned by investing the cash, the cost is about 0.66 percent. These stocks do not pay dividends, so the manager is forgoing the dividend yield.

## Case C

*Scenario:* Portfolio Manager C owns a portfolio with 3 percent tracking to the S&P 500 and thinks that

medium and small stocks will benefit from a Clinton victory and the January effect. This large-capitalization manager considers switching all holdings that are too expensive and wants to do a relative performance option set up on October 30.

The proposal is to buy three-month OTC option based on the capital return difference between the S&P 500 and the S&P MidCap. The value of the S&P 500 is 418.68, and the value of the S&P MidCap is 147.70.

*Discussion:* The objective is to capture the capital return difference between the S&P 500 and the S&P MidCap. The extent to which the MidCap outperforms the S&P 500 will be the amount of this manager's participation. The cost is 250 basis points. If the MidCap underperforms, the loss is limited because the manager has spent 250 basis points. This strategy has an asymmetric payoff, because it will pay even if the manager's investment view is wrong but can benefit to the full extent that the S&P MidCap outperforms the S&P 500.

The result of the strategy is that, during the period from October 30 to January 18, the MidCap outperforms the S&P by 5.02 percent, so the return, net of cost, was 252 basis points. This strategy can be implemented in Germany versus the United States or in TOPIX versus the Nikkei 225. These options will be cheaper than an option on the underlying index, because the pricing is based on the relative volatility and correlation of the two indexes, rather than the volatility of the index itself.

## Conclusion

Within the past few years, the reach of futures and options strategies has been extended globally as international index futures markets have gained depth and pricing efficiency and OTC options on major indexes have become available through dealers to complement short-term index options traded on exchanges. Futures mispricing and tracking error to commonly used benchmarks is a bit higher internationally than in the United States, but the trading and operational cost savings available through derivatives use are also larger in magnitude. Futures are most useful for managing symmetric equity exposure to a given country market, and index options are commonly used for risk management purposes. They serve as a method of customizing a payoff profile to fit better with the market view of the investor compared to simply raising cash to reduce risk. The option strategy case studies shown here can be easily modified for industry indexes in the U.S. market, as well as for international index exposures.

---

# Question and Answer Session

Gary L. Gastineau  
Joanne M. Hill

**Question:** In light of the high volatility of the Nikkei 225 and possible market manipulation of the index, how good or appropriate are tracking models? Are there any references to the optimal adjustment of tracking baskets?

**Hill:** The Japanese market presents two problems. First, the index has gone from 14 percent to 28 percent volatility in a few years. With that amount of change in risk, the tracking models, which are often based on five years of historical data, are undergoing changes. The numbers for tracking error move. For example, the BARRA tracking numbers, because they are based on historical data, gradually work their way up to adapt to the new volatility environment. Because of this change, it is hard to know whether the tracking has gotten worse or the volatility has gotten higher.

Second, because the Nikkei 225 is a price-weighted index, building a tracking basket for it is very hard because small, less liquid stocks can influence the index levels and need to be represented. People deal with this problem in several ways. One is to use a different benchmark. Managers must decide whether using a particular benchmark like the MSCI Index or the FT is more important than constructing a capitalization-weighted benchmark out of the indexes that underlie the futures. Global investors must start thinking more about how to get exposure and less about how close they are to a country's index. Because what is the best index is not

clear in many of these countries, global investors have more tolerance for tracking risk.

For rebalancing, managers must look at the most recent data and use statistical regression more than fundamentals in developing global tracking baskets.

**Question:** Do time-decay issues with regard to collars affect the true payoff at expiration? If not, why worry about time decay?

**Hill:** An investor with a specific horizon who keeps to that horizon does not need to worry about closing out the options strategy prior to the short option positions experiencing their time decay. The horizon does not affect the payoff at expiration. If an investor has a specific horizon and does not care what happens in the interim, he or she can put the investment in place and go away for the six months or a year until it is over. That individual is hard to find, however. Most people will need to unwind the strategy because of new circumstances. Suppose the index has risen sharply, and the investor now wants to buy exposure. The investor wants to see what the cost will be to buy these options back and sell them in the interim. Something like that can always happen.

Options, like bonds, force you to choose a maturity, but people who buy 30-year bonds do not necessarily have 30-year horizons. They might trade in and out of long-term bonds but still want them for their duration characteristics. You might have the same type of strategy or tactic with options.

**Question:** Which non-U.S. option contracts (exchange traded or OTC) are approved for use by U.S. investors?

**Gastineau:** The issue on the futures contracts is buried in the legislation covering the renewal of the Commodity Futures Trading Commission (CFTC) authorization that preceded the late 1992 reauthorization. When Congress renewed the authorization, it added a complex procedure by which the SEC and CFTC must both approve an index. The exchange in which the futures contract is traded must subject itself to the authority of the CFTC, and a few other things must be done. No such requirement is in place for options contracts. If U.S. investors want to buy options contracts on the DAX or Hang Seng indexes (for which they are not permitted to use futures contracts), they can, because options do not fall under CFTC jurisdiction.

**Question:** Please explain "market impact."

**Hill:** Market impact is a trader's estimate of how much a transaction would effect the market or the size of the spread. It is an embedded cost of trading. Perold wrote an excellent article recommending taking a snapshot of a portfolio before transacting, having a trading horizon, and then looking at what the realized cost is to measure market impact.<sup>1</sup>

<sup>1</sup>André F. Perold, "The Implementation Shortfall: Paper versus Reality," *Journal of Portfolio Management*, vol. 14, no. 3 (Spring 1988):4-9.

---

**Question:** Over a long term, say ten years, would the cost of maintaining a futures position in indexes such as the EAFE become more expensive than maintaining a moderately diversified portfolio of the same stocks with reasonable turnover?

**Gastineau:** First, the EAFE is not the index you want to match. Second, doing a continual roll of futures for ten years is probably not the way to go on most of these futures contracts. Approaches that might be attractive are a ten-year swap or a sequence of swaps of shorter duration that are continually rolled over with the same financial intermediary or, by agreement, switched from one financial intermediary to another so that the withholding tax is avoided. If the financial intermediary is, in effect, making the decision for its own account whether to take the position via futures or via the underlying stocks and thereby taking advantage of the tax characteristics, the swaps will in many cases provide a better return than taking a posi-

tion in the underlying stock in the index. Each institution must look at the economics of each of these markets for its own particular circumstances.

For example, most investors who want to invest in the German market today would be well advised to go to their friendly financial intermediaries. The intermediaries would either swap them or sell them a return embedded in some other instrument that would outperform the DAX over any reasonable time horizon during which they would want to take the position.

The DAX is a total return index, so it includes dividends. Investors must watch whether the quotes they are getting on other indexes include dividends. Different firms will quote these instruments in different ways.

**Question:** Is stochastic dominance a sure way to choose between options alternatives?

**Hill:** The stochastic-dominance approach might be useful in proving a strategy that appears to

dominate an alternative strategy that lies on an efficient frontier in mean-variance space. Stochastic dominance looks at how a whole distribution compares with another. This approach may screen out strategies that appear to dominate in mean-standard deviation spaces but in fact do not when you look at the entire distribution. This concept is difficult to apply in practice, however, because the entire distribution must be estimated and the stochastic-dominance criteria can find a wide range of strategies that do not dominate one another.

**Question:** Please comment on option performance measurement.

**Hill:** Option performances for a portfolio manager should be integrated with that of the underlying index or stocks being hedged with options. The delta of the position combined with options can be useful in constructing risk-equivalent strategies for comparison purposes.