The Uses and Risks of Derivatives

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Derivative products offer a means of improving performance, controlling risk, and increasing flexibility. The use of derivatives also introduces risks, however, and those risks have been increased by the globalization of financial markets and the speed and complexity brought by technological advances. Choice among the various derivative instruments and strategies requires careful consideration of the benefits and drawbacks of each instrument. Risk management requires scenario analysis for existing strategies and internal risk-control processes.

Since their inception, derivative securities have always been controversial, and anyone involved in derivative research can expect to be on the defensive. This presentation provides a definition of derivative securities, followed by the history of their use and a discussion of why they are receiving increased attention today. The presentation then focuses on why derivatives should be considered return-enhancement and risk-management tools and looks at ways in which equity derivatives are being applied in international investing. The presentation closes with a discussion of the risks incurred in derivatives use and suggests some ways to manage this risk internally.[1]

Derivatives

Derivative securities allow investors to match a set of securities or portfolios to a set of risk and return opportunities. In other words, by using derivatives, investors can transform the risk–return profiles of existing portfolios to match their desired risk–return profiles. Many of these transformations are standard and carried out by numerous investors, which has led to the creation of basic, standardized, exchange-traded options and index futures. Other transformations are unique—perhaps for an investor who has an accounting issue or a capital constraint that requires customized derivatives. Derivative securities can be bought or sold, and counterparties can be an exchange clearinghouse or, in the case of customized contracts, other financial market participants.

Derivatives can be defined as tradable contracts that provide a payoff contingent on the price movement of an underlying asset. Derivative contracts in the United States are written on several types of assets: equities, debt or other interest-rate-sensitive instruments, currencies, commodities, and market indexes (such as the S&P 500 Index). The payoffs can take the form of physical delivery of the actual underlying asset or, as occurs in most cases, a cash settlement of gains and losses without the underlying asset ever changing hands.

The return or payoff pattern can take several forms: In a *symmetrical* pattern, as in the case of futures, forward, and swap contracts, potential gains or losses are equivalent; in an *asymmetrical* pat-

[1]Remarks here are partly drawn from the speeches of E. Gerald Corrigan, chairman of Goldman Sachs International Advisors; comments from Fischer Black; and speeches of Federal Reserve Board Governor Susan Phillips.

tern, as with options, the downside risk for the buyer is limited to the purchase price (or premium) of the option, but the upside potential is theoretically unlimited; in a *contingent* payoff pattern, such as relative index options or contingent options, the payoff pattern depends on the price or yield level of another security—for example, call options on the Nikkei 225 Index with a payoff contingent on the yen/dollar exchange rate.

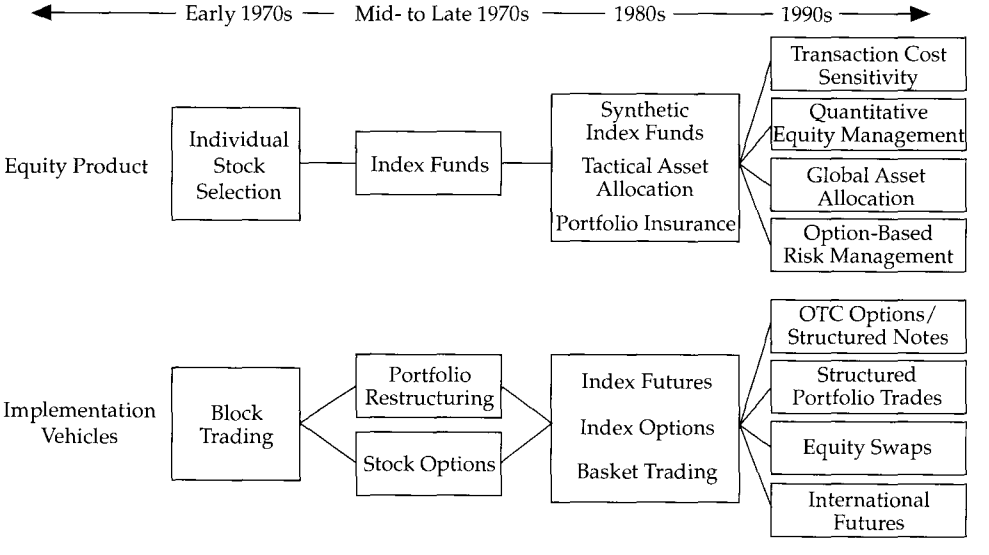
Trading activity in derivative securities can be measured in various ways. When these products were first introduced, activity was measured in terms of the notional value of the underlying contract. This approach was designed to provide the appearance of very active and liquid markets, but it also frightened many investors into believing that potential trading requirements were large when, in reality, only small portions of the notional values were trading, just as only small portions of outstanding bonds and stocks trade on a typical day. Also, much of the notional value is double-counted because many institutions have offsetting derivatives as assets and liabilities. Now, the general practice is to use trading volume as the measure of trading activity in derivatives.

History of Derivative Products

From a historical perspective, derivative contracts have been around for a long time. Farmers in the late 1800s were using forward contracts to lock in the selling price of their produce in much the same way modern portfolio managers lock in security purchase and sale prices through derivative securities. Many of the common features of derivatives have remained unchanged over time: They were created originally for controlling and reducing risk and, despite all the innovations, are still used to control and reduce risk and to increase flexibility for users of financial instruments.

Much of the evolution of equity derivatives mirrored technological advances in the financial markets. As **Figure 1** illustrates, in the early 1970s, when most investment managers were using a bottom-up approach, stock selection was the key ingredient to success and block trading was used to adjust risk–return profiles. In the mid- to late 1970s, the emergence of index funds and portfolio management brought about the development of stock options. In the 1980s, the development of such equity products as synthetic index funds, tactical asset allocation, and portfolio insurance necessitated the development of index futures and index option con-

Figure 1. Evolution of Equity Derivatives and Portfolio Strategies



Source: Goldman, Sachs & Co.

tracts. The 1990s have brought further refinement in derivative products, much of which has been driven by investors' sensitivity to transaction costs and the globalization of the asset allocation process. Over-the-counter (OTC) options and structured notes, equity swap contracts, international futures contracts, and a raft of other instruments emerged to meet those needs.

Using Derivatives in Global Portfolios

Why are derivative products the subject of so much attention today? One factor is the increased risk of dealing and investing brought on by technological advances in financial market transactions and communications. Information about global events is transmitted instantly, which causes instantaneous market reactions and often results in price volatility being transmitted from one market to another. In this environment, investors are demanding a wide range of financial products that will allow them to move quickly to insulate themselves from the risks associated with these price fluctuations. The risk transfer that derivative products allows has permitted dealers and bankers to tighten bid–ask spreads, to position large trades (a clear benefit to equity investors and pension funds that need to move large amounts of money), and to broaden market access.

The heightened awareness of the risk-reducing properties of derivatives has increased their acceptance and use. When the Financial Executive Institute conducted a survey in 1994 of 113 large U.S. funds to determine derivative use by pension plans, the researchers found the most often used derivative product to be a futures contract, used by 85 percent of the respondents. Options, primarily debt and equity options, were used by 55 percent; only 14 percent used swaps. A large number of respondents, 73 percent, said that they relied on an external manager for implementing their derivatives strategies.

Sensitivity to transaction costs is the primary reason clients of Goldman, Sachs & Company use derivatives. Among our North American clients involved in global portfolio or derivatives trading, approximately 50 percent of derivatives applications are in the international area. Derivatives are a cost-effective way of increasing exposure in different global markets. In addition, firms with global portfolios find derivatives preferable to a costly and cumbersome strategy of using individual stocks for asset allocation. We find option strategies involving derivative products are typically *ad hoc*, however, in the sense that most of the transactions are conducted because of a specific view or need that the option payoff fits.

Replicating an International Index with Futures

Three strategies are useful for producing the same payoff when replicating an international index fund—buy the index, buy the futures, or buy the swap. **Exhibit 1** shows the payoffs from each. For example, in buying stocks in an index—anything from the Nikkei 225 to the IPC in Mexico to the S&P 500—returns include dividends, capital gains or losses, and perhaps a return on lending

Exhibit 1. Three Ways of Owning an Index Fund

Buy the Index	Buy the Future	Buy the Swap
+ Dividends	+ Interest income[a]	+ Interest income
+ Ending value of the index (capital gains or losses)	+ Ending value of the index (capital gains or losses)	+ Total return on the index (gains plus dividends)
+ Return on stock lending	– Futures premium	– Fixed- or floating-rate payment

Note: An investor is indifferent between buying stocks and futures when: Futures premium = (Interest rate – Dividend yield – Stock lending return) × Index. An investor is indifferent between buying stocks and entering into a swap when: Interest income = Fixed-rate (or floating-rate) payment. (Formulas are before transaction costs. Any difference in transaction cost should also be reflected in the calculation.)

[a]No cash outlay is required when buying futures. Money can be invested in money market securities.

Source: Goldman, Sachs & Co.

the stock. An equivalent transaction is to purchase a futures contract and place the notional value in an interest-bearing security with a maturity equal to the expiration of the futures contract. The third approach is to use an equity index swap. Swaps are used primarily when the investor wants customized features of index returns, such as a special time frame, or has a horizon of a year or more. Swaps usually become cost competitive vis-à-vis futures only after a year or more. The payoff from the swap can be based on total returns or, depending on the nature of the swap, capital gains (losses) only. The difference between the floating-rate payments and total or capital returns of the index is paid by the swap seller to the owner of the swap. If the index return is less than the floating-rate payment, the swap holder must provide funds to the swap seller.

Using futures has several advantages over buying an index. Through trading futures on global stock indexes and government bond markets, an investor can easily create an exposure that participates in upside and downside moves in the underlying security or index. The monies in excess of the initial margin required for the futures contract can be invested in cash-enhancing strategies (a risk-free, interest-bearing government security, for example) to provide incremental returns. Managers with good track records of earning incremental returns from cash management can combine futures or swaps with cash management to raise alphas for their equity investments. Any cheapness in the price of the futures contract will be an added benefit to the strategy.

Another advantage of using certain derivative products is the liquidity in those derivative markets. Futures and swaps trade in almost all the major markets around the globe. **Table 1** shows countries with stock index futures contracts and index swaps that can be hedged as of the end of 1994. Among the 24 equity markets covered by the Financial Times-Actuaries World Indexes (FT-AWI), 17 have index futures contracts. That percentage represents about 96 percent of the capitalization of the FT-AWI, of which about 87 percent have Commodity Futures Trading Commission (CFTC) approval.

Table 1. Countries with Stock Index Futures Contracts and Index Swaps that Can Be Hedged

Country	Percent of FT-AWI EuroPac Index	Percent of FT-AWI World Index
Australia[a]	2.79	1.60
Austria	0.27	0.16
Belgium	1.22	0.70
Canada[a]	—	1.53
Denmark	0.62	0.36
France[a]	5.76	3.32
Germany[a]	6.28	3.62
Hong Kong[a]	3.07	1.77
Italy	2.24	1.29
Japan[a]	43.81	25.22
Malaysia[b]	1.89	1.09
The Netherlands	3.55	2.04
New Zealand	0.35	0.20
Spain[a]	1.71	0.98
Sweden	2.24	1.29
Switzerland	4.82	2.77
United States[a]	—	38.90
United Kingdom	16.69	9.61
Total as of 9/30/95	95.42	95.36
CFTC approved	82.35	87.84

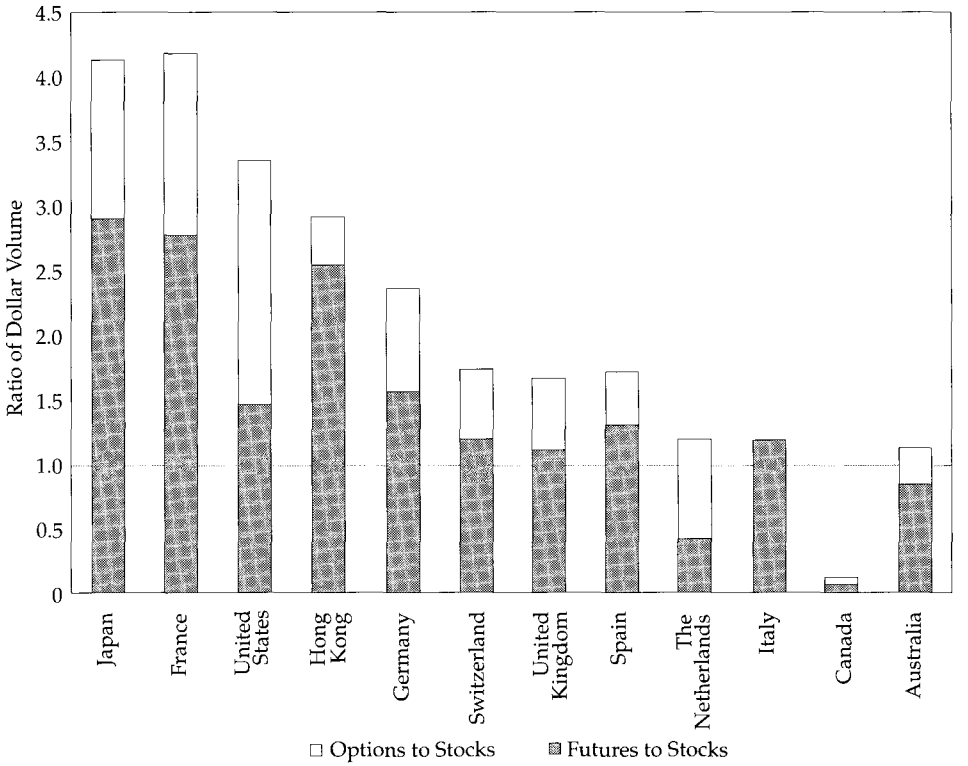
[a]U.S. access to index futures.
[b]To be launched by the end of 1995.

Source: Goldman, Sachs and Co., based on data from the FT-AWI.

The dollar amount traded in these global futures and options markets is significant. **Figure 2** shows the ratio of average daily volume on the global futures and options markets relative to the stock volume on the primary exchange in each market. In most markets, the futures-plus-options volume is a multiple between 1 and 3 of the underlying stock volume. Although this figure is somewhat misleading, because some of the futures trading is the result of rolling over positions every three months, the volume in derivatives markets is nevertheless sizable, especially considering that all trades in the derivatives market are portfolio trades (compared with only about 5 percent of the trades on the NYSE).

The most significant advantage to using futures contracts to increase international exposure is the savings on transaction costs. Bid–ask spreads for futures are a small fraction of what they are for stocks. Thus, portfolio managers can capture more return or a dealer can make tighter markets for futures-related trades than for individual stocks.

Figure 2. Average Daily Volume of Global Futures and Options Markets versus Cash Markets, 1994



	Japan	France	United States	Hong Kong	Germany	Switzerland	United Kingdom	Spain	The Netherlands	Italy	Canada	Australia
Futures to stocks	2.92	2.76	1.45	2.53	1.55	1.19	1.07	1.27	0.40	1.16	0.06	0.81
Options to stocks	1.22	1.42	1.90	0.37	0.79	0.52	0.57	0.42	0.77	0.00	0.03	0.28
Options to stocks + Futures to stocks	4.13	4.18	3.35	2.91	2.34	1.71	1.64	1.69	1.17	1.16	0.09	1.09

Source: Goldman, Sachs & Co.

Table 2 compares the round-trip costs of trading a $25 million portfolio of stocks versus futures in five markets. In every major market, the costs of trading futures are significantly lower than those associated with stocks. In the United States, for example, trading with stocks is ten times more expensive than trading with futures contracts. On an annual basis, considering the fact that futures may be called several times to maintain open interest, we have found that the difference in estimated costs associated with commissions and market impact on the spread is 30–40 basis points (bps) compared with that of stocks.

Strategy Implementation

Suppose an investor wants to replicate the MSCI EAFE or the FT-AWI EuroPac with index futures to lower transaction costs. Futures liquidity makes this strategy viable, but a strategy of replicating an international index fund with futures raises several issues: an appropriate benchmark, the countries that will be used, the weighting schemes, cash management, the method for handling currency exposure, and performance measurement. These issues should be dealt with before the strategy is undertaken.

A primary issue in international markets is that futures trade on local indexes, not on such commonly used benchmarks as the FT-AWI or the MSCI world or country indexes. In addition, futures contracts may not be available in all the countries that are represented in the index.

These snags lead to differences in performance between the benchmark index and the synthetic index. **Table 3** shows the tracking error of all of the futures indexes (not capitalization weighted) versus the FT-AWI and the MSCI indexes. Most of the futures indexes are similar to the FT-AWI and the MSCI; tracking errors are in the 1–3 percent range. Whether this size of error is acceptable or not depends on the investor's or manager's tolerance for tracking error. Combining futures across indexes on a cap-weighted basis lowers tracking errors—0.97 percent with the FT-AWI and 0.85 with the MSCI—and some of these tracking risks within each country are diversifiable.

Other differences in performance between benchmark indexes and synthetic indexes include the costs and benefits associated with rolling futures and futures mispricing, trading cost savings, the tax effects of not being subject to dividend withholding, and savings on custody and clearing charges. **Table 4** shows that in 1994, a U.S. investor in an international, cap-weighted synthetic index fund would have realized, including dividends, a savings of approxi-

Table 2. Round-Trip Costs of Trading Stocks and Futures, as of October 1993

	United States	Japan	United Kingdom	France	Germany
Stocks					
Commissions	0.14%	0.20%	0.20%	0.25%	0.25%
Market impact[a]	0.55	0.70	0.70	0.50	0.50
Taxes	0.00	0.30	0.50	0.00	0.00
Total	0.69%	1.20%	1.40%	0.75%	0.75%
Futures					
Commissions[b]	0.01	0.05	0.02	0.03	0.02
Market impact[a]	0.05	0.10	0.10	0.10	0.10
Taxes	0.00	0.00	0.00	0.00	0.00
Total	0.06%	0.15%	0.12%	0.13%	0.12%
Futures as percent of stocks	8.70	12.50	8.60	17.00	16.00

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

[a]Trader estimate.

[b]Local indexes: S&P 500, Nikkei 225, FT-SE 100, CAC 40, DAX. All contracts are quarterly except for the CAC 40.

Source: Goldman, Sachs & Co.

Table 3. FT-AWI and MSCI Country Indexes versus Futures Indexes, as of December 30, 1994

Country	Futures Index	1995 Average Daily Stock Volume (US$millions)	1995 Average Daily Options Volume (US$millions)	1995 Average Daily Futures Volume (US$millions)	Tracking Error versus FT-AWI[a]	Tracking Error versus MSCI[a]	Number of Stocks in Index	Number of Companies in FT-AWI	Number of Companies in MSCI
Australia	All ordinary shares	338	130	284	1.93	2.38	316	82	50
Canada	TSE 35	568	196	33	2.68	2.12	35	102	86
	TSE 100	—	—	—	2.83	1.47	100	—	86
France	CAC 40	647	958	1,937	1.96	1.77	40	101	69
Germany	DAX 30	1,663	1,297	2,643	1.95	2.08	30	59	67
Hong Kong	Hang Seng	406	270	1,053	5.22	3.81	33	55	38
Italy	MIB 30	382	—	334	1.34	2.32	30	58	63
Japan[b]	TOPIX	2,862	—	1,595	1.87	2.38	1,235	483	317
	Nikkei 300	—	—	252	1.12	1.04	300	—	317
	Nikkei 225	—	4,033	—	6.20	6.16	225	—	317
The Netherlands	AEX	413	304	174	3.17	3.57	25	19	22
Spain	IBEX 35	206	92	261	1.01	1.67	35	38	32
Sweden	OMX	—	—	—	1.83	2.62	30	48	28
Switzerland	SMI	455	270	637	1.60	1.01	22	46	47
United Kingdom	FT-SE 100	1,431	890	1,775	0.88	1.25	103	203	146
United States[c]	S&P 500	12,987[d]	11,419	19,052	0.72	0.87	500	506	382
	S&P MidCap	—	—	83	5.33	5.46	400	—	382

[a]Regional/capitalization-weighted futures: FT/S&P-AWI world, tracking error = 0.88; MSCI world tracking error = 0.76 percent.
[b]Optimal combination for Japan FT/S&P-AWI: Nikkei 300 = 65.2 percent, TOPIX = 34.8 percent, tracking error = 0.67 percent; for Japan MSCI: Nikkei 300 = 85.8 percent, TOPIX = 15.2 percent, tracking error = 1.00.
[c]Optimal combination for Russell 1000 Index: S&P 500 = 86.52 percent, S&P MidCap = 13.48 percent, tracking error = 0.73.
[d]NYSE.

Source: Goldman, Sachs & Co., based on BARRA Country Models; Global Equity Model used for Hong Kong and Italy.

Table 4. Costs versus Benefits of Selected Stock Index Futures

Country	Index	Weight[a]	Annualized Futures Mispricing	Dividend Yield	Dividend Benefit[b]	Net Cost or Benefit
Australia	All Ords	2.93%	–1.70%	3.81%	0.57%	–2.27%
France	CAC 40	6.69	–0.68	2.09	0.00	–0.68
Germany	DAX	7.02	–0.65	1.95	0.29	–0.94
Hong Kong	Hang Seng	5.18	–0.34	3.33	0.00	–0.34
Japan	TOPIX	48.66	0.24	0.78	0.12	0.12
The Netherlands	EOE	3.40	0.34	2.92	0.44	–0.10
Spain	IBEX	1.76	–0.96	4.06	0.61	–1.57
Switzerland	SMI	4.57	–0.07	2.05	0.31	–0.38
United Kingdom	FT-SE 100	19.79	0.13	4.13	0.62	–0.49
Weighted average			–0.02%		0.33%	–0.28%

[a]Weights based on FT-AWI EuroPac as of December 31, 1993.
[b]Dividend tax benefit calculated by taking the difference between the dividends used in the futures fair-value calculation and the dividend the investor would receive if he or she purchased stocks. Fair-value calculations here assume 100 percent of gross dividends. The investor holding stocks was assumed to receive 85 percent of gross dividends (except for France and Hong Kong, where 100 percent was used).

Source: Goldman, Sachs & Co.

mately 28 bps over owning the relevant indexes. A basket containing the S&P 500 and these futures had an annualized futures mispricing of –0.11 percent, a dividend tax benefit of 0.33 percent, and a net cost of –0.44 percent.

Using futures contracts facilitates the separation of currency management from equity management. If the hypothetical investor in this section were to buy a futures contract on the Tokyo Stock Price Index (TOPIX) or the Nikkei 300, the gains and losses would be denominated in yen, but the investor would not need to go and buy yen on the day of purchasing the futures contract except to post initial margin. This investor's exposure to the yen would be limited to gains and losses, the initial margin position, and any cash reserves held in yen for marking to market. On the other hand, if the investor were to buy a portfolio of Japanese stocks, she or he would automatically incur the currency exposure because the entire purchase would be denominated in yen.

Index Option Strategies

As the volume of index futures and options has grown, money managers have increased their use of options in investment strategies. Factors that influence an option's price are historical volatility, implied volatility minus historical volatility, the correlations of volatility between markets, performance of the underlying index, the option's strike price, and the option's time of expiration. The most common applications of index options are option overwriting, tailored hedging strategies, options sales in tactical asset allocation, and index return enhancement with volatility trading.

■ *Index option overwriting.* This strategy is motivated by a desire to capitalize on the spread between implied volatility and historical volatility and to trade off some capital gains for "yield." Index option overwriting is typically an overlay strategy. Primarily, it uses short-term, near out-of-the-money (OTM) call options. These options often have low implied volatilities, but the strategy can still have favorable returns as long as the volatility is above historical levels and the index has poor to moderately positive performance. Common vehicles are S&P 500 or 100 calls, listed options traded on the Chicago Board Options Exchange, and OTC options, which can be cleared by the options clearinghouse (called FLEX) or be negotiated directly with dealers.

■ *Tailored hedging strategies.* Portfolios of options can be constructed based on a client's specific views and risk criteria. Managers use a combination of put and call options to design the mix of upside and downside performance that most appeals to the client. Vehicles for this strategy are U.S. and international

listed and OTC options. Typically, three to five strategies are considered and compared, through scenario analysis and backtesting, in different market environments. The most widely used hedging strategies include long OTM puts, put spreads (in which a long put is combined with the sale of an OTM put option), collars (in which a put is combined with a short call, capping upside potential but financing the cost of the hedge).

■ *Option sales in tactical asset allocation.* Tactical application of options is another means of adding value consistent with a fundamental view on relative asset-class values. If an asset allocation model can add value by tilting asset-class exposures, it should also be able to add value using options as a volatility-trading vehicle. Most asset allocation models contain implicit volatility and correlation assumptions. Implied volatility in options, in general, is not necessarily a good forecast of volatility. Implied volatilities react to very recent trading patterns—rising in high-volatility environments and falling in low-volatility environments. Asset allocation managers have transaction plans contingent on index levels and other factors. The delta of an option can be viewed as a component of the asset-mix weight, which moves with the index, thus allowing the investor to circumvent the need to trade.

Short-term listed options, primarily in the United States, are the common vehicles in this strategy. Typically, managers sell short-term options when the spread between implied and historical volatility is high and they are near their benchmark mix.

Selling puts and calls with strike prices at trigger purchase-and-sell levels can add to return but may provide opportunity costs in markets that move sharply up or down. Consider this strategy: sell index puts with strike prices at likely purchase points and sell index calls at likely selling points. The advantages of such a strategy are:

- the investor receives a premium for committing to a transaction likely to be made anyway.
- the premium adds to the return if strike prices are not reached.
- the investor can benefit from high implied volatilities in OTM puts.

The disadvantages are:

- the strategy does not fit well when the switch is from stocks to bonds.
- if the index moves up or down, the investor may be forced to transact at an unfavorable price.
- prior to expiration, having a net exposure based on option delta affects short-term performance.
- the investor can be hurt by increases in volatility in the short term.
- OTM calls sometimes offer low premiums.

When pursuing this strategy, managers should favor using short-term options (because the target mix can change) and selling puts rather than selling calls. Other recommended approaches are to be selective based on volatility environments and to use the options early in a move toward favoring a new asset class or when the investor's conviction is not strong.

■ *Index return enhancement with volatility trading.* In this strategy, market-neutral positions in index options are used as an enhancement to an underlying equity exposure. This strategy can use listed U.S. options or international OTC options.

The strategy involves, first, scanning global index option markets for absolute- or relative-volatility trading opportunities: to sell or buy versus a delta-weighted futures position, to long/short positions for options of a different term, to benefit from a shift in OTM puts versus calls, or to take advantage of a cross-market volatility spread based on relative market volatility.

The second step is to use scenario analysis to evaluate risks and rewards and decide trade size in light of the tolerable loss. Short volatility positions are often hedged against extreme, crash-type, scenarios.

OTC Options versus Listed Options

OTC options are options contracts privately negotiated between two parties who agree on the underlying stock, stock portfolio, or index, as well as the

strike price, expiration, and exercise style. OTC options differ from listed options in several ways:

Typically, listed options have shorter maturities than OTC options, although some long options exist. OTC options are executed over the counter by traders at investment and commercial banks. Settlement is negotiated by the counterparties. Whereas listed options are dominated by blue chips and major stock indexes, OTC options can be based on almost any stock, a portfolio of stocks, and domestic or international indexes. Exercise of OTC options can be by American or European conventions, and it can also be based on the maximum or average values of the equity during the life of the options. OTC options can also include "knock-out" features (that is, if the asset reaches a certain price before expiration, the option automatically expires).

OTC or structured products fill the gaps in listed derivatives trading. They can be customized to a specific purpose, market, or horizon. They provide access to markets in which the dealer is an active participant but the client has limited access. They effect large-scale "block-trading" of index exposures or relative exposures while providing confidentiality when a strategy is being executed and enabling the coordination of a hedge. They are helpful in executing strategies based on multiple options, such as collars. Finally, they may be attractively priced when they fit well into a dealer's book.

OTC index products are a good choice in certain circumstances and a poor choice in others. They are very suitable if the strategy is complex, the trade is of a very large size, or the investor has a very specific strategy. For example, OTC options are useful for combining a stock index and currency risk management into a single option or if upside participation is in a basket of cyclical stocks from the United States and Europe. These products also fit well when the objective is to hide a transaction, perhaps because it is large, from the market; when the dealer has lower costs (perhaps because of economies of scale in running a large book) or better market access than the exchanges; when pricing or a diversification advantage to the dealer is being passed to a client; or when the strategy involves monitoring, operational, analytical, or custody costs that can be packaged into the OTC options.

OTC index products are a poor fit if the cost of using the products is the same for an equivalent strategy using the liquid exchanges; in the face of concerns about the creditworthiness of the seller or the size of the transaction in relation to the dealer's capital; if the investor wants transparency in pricing and the ability to monitor price continuously; if the investor wants the flexibility to modify the strategy easily if opinions about the market change; or if tax, accounting, or legal treatment is uncertain.

Structured Notes for Capturing Index Returns

A structured note combines an option payoff with a low- or zero-coupon note of similar maturity. The approximate percentage of value at issue for a five-year note or a call or put option on an index is 25 percent, whereas the approximate percentage of value on a bond or preferred stock is 75 percent. A purchase of a call or put option is to obtain a proportional upside or downside capture with a return floor. A sale is to increase the coupon for a commitment to exchange the bond for the index exposure. The issuer of the bond or preferred stock can be Goldman, Sachs or an alternative credit.

Equity-linked notes can be structured to meet specific equity market views and to create customized risk profiles. General security structures are principal-linked notes, coupon-linked notes, and capped or floored exposures. Structured notes can be designed to have embedded leverage, and directional views can be bullish or bearish. Maturities are usually chosen by investors based on their investment horizons.

The underlying securities are broad-based equity indexes, stock baskets, and single stocks. The market exposures are domestic equities, European equities (on the DAX, CAC, Financial Times Stock Exchange [FT-SE] 100, and so on), Asian equities (on the Nikkei, TOPIX, and so

on), and Latin American/emerging market equities on various indexes.

Risk Management and Derivatives

Heretofore, the guidelines governing institutional use of derivatives have varied among institutions. Guidelines of the Employee Retirement Income Security Act of 1974 define ways in which pension funds can use derivatives, and prospectuses define how investment companies can use derivatives. In both cases, use of leverage is highly restricted for any securities, including derivatives. Corporate and municipal treasurers have few constraints, however, on how they use derivatives. The sanction on their behavior is very indirect—oversight by a group of accountants or auditors, for example, or by shareholders, chief financial officers, or taxpayers. Equity investors have little information about the extent to which corporate treasurers use derivative products; therefore, regulators, such as the SEC and the Financial Accounting Standards Board, are exploring procedures and rules that would improve disclosure of corporate derivatives use. Investors need this information, and they need to understand the risks associated with using derivatives.

The increased attention to derivative products has caused all investment professionals to rethink how the industry measures and manages risk. In this regard, understanding why derivatives have caused some of the problems they have apparently caused is important.

First, many of the risks associated with derivatives are inherent in most securities traded in dealer markets today. Concerns about derivatives are thus, in part, the manifestation of broader concerns about the impact of changes in financial markets. In particular, changing and ever more sophisticated technology has dramatically increased the complexity associated with managing investment portfolios, especially those with derivative instruments. As technological complexity has increased, so has the speed with which transactions occur and values change. This combination of speed and complexity adds a new dimension of risk and creates the need for discipline and control in the use of derivatives.

Sources of Risk

Risk lies everywhere in the economy. Do derivatives pose a greater systematic risk to our financial system than other equity and interest rate risks? The ability to transfer or hedge risk that comes from using derivatives reduces the likelihood of systemic financial shock. Even if the statistical probability of a systemic shock is reduced, however, the potential consequences may be heightened by the use of derivatives because of complexity, speed, and the global transactional factors involved in their use. In a crisis, such as the Mexican peso crisis, the consequences can be severe because of the need to adjust positions, especially if capital commitments are large. Another factor that has the potential to exacerbate losses during a crisis is that terms of the deals are no longer so easily renegotiated as they were in the past among the private parties involved; the increased involvement of pension and mutual funds in the derivatives markets precludes such negotiations. Therefore, crises can be more severe and require more government intervention than in the past. So, loss from using derivatives is a low-probability event with the potential for a lot of damage.

With the trend toward top-down investing—that is, greater emphasis on asset allocation and less on stock selection—many derivatives have been applied to manage the largest risk factor—aggregate market risk—and misuse can have major consequences for the entire investment portfolio. Options and securities with embedded options are transformed automatically as market conditions change. Although market participants can create instruments, such as selling puts, that are almost irresistibly appealing under certain market conditions, those options can turn into werewolves if the market conditions change. The huge losses incurred by Orange County, California, through trading derivatives on levered bond portfolios is a good example of how payoff patterns can change adversely in the

event of extreme market moves.

Because some types of market risk can be hidden, the only way to detect their existence is to use scenario analysis that includes unlikely scenarios that may have extremely adverse outcomes. Concepts such as standard deviation alone cannot capture the effects of extreme market changes on options with asymmetrical payoffs. The scenario analysis should focus on portfolios, not individual securities, and concentrate on crisis situations. Simulations of potential losses permit decisions about position limits and about how much to hold in a particular portfolio. Most buy-side and sell-side firms are setting up such procedures to analyze whether a werewolf is waiting in the wings within their derivative and other security holdings.

Another risk associated with derivatives, but one that is common to most other securities traded in dealer markets, is the risk of illiquidity. Dynamic portfolio strategies that appear to have a low cost in liquid markets become very costly when market movements create illiquidity. Liquidity risk is one of the hardest things to quantify, but with enough data from previous crises, investors can stress-test bid–ask spreads under various market-liquidity conditions.

Leverage is another factor that can affect the riskiness of derivatives. Derivatives can introduce leverage into a portfolio, and whereas leverage is profitable in a unidirectional market, leverage is also risky. Some of the focus in risk control, therefore, should be on constraining the use of leverage to levels appropriate with the level of capital available to the institution. In Orange County, the payoff pattern was apparently levered, which created enhanced returns in periods of declining interest rates but magnified losses in periods of rising rates.

Detecting and controlling for leverage is possible by carefully marking positions to market. Many of the scandals involving derivative products developed in funds that use book-value accounting. Careful marking to market could have limited losses in those cases by providing a measure of the risk of loss in the interim prior to maturity of the derivative instruments.

Internal Risk Controls

Improving the investment organization's internal management of the risks associated with derivatives will mean less intervention from outside and less imposed regulation. A good starting point for internal risk management is the guidelines for procedures and controls outlined in two Group of Thirty reports.[2] The Group of Thirty reports, published in July 1993, make the following recommendations:

- Derivatives trading should have active board and senior management oversight.
- Internal risk management should be independent of trading.
- The firm should perform internal audits.
- Management information systems should be upgraded.
- Risk-measurement techniques should include stress tests, model validation, and illiquidity tests.
- Firms should disclose critical exposures to owners/creditors.

Most of these guidelines are already being used by the securities dealers and banks to initiate some healthy procedures for internal risk control. The Group of Thirty recently conducted a follow-up survey of industry practices to the one they published with the report. They found that approximately 88 percent of the responding dealers will be in compliance with the first five recommendations by early 1996. The disclosure called for in the final point is troublesome for firms because it raises a question about revealing competitive information. Only about 14 percent disclosed in 1993, and approximately 42 percent apparently intend to disclose next year.

Results of the survey with respect to the end users of derivatives—investment managers—indicate that only 8 percent used some form of probability analysis within a time horizon. As many as one-third thought measuring the risk of loss

[2]The Group of Thirty is a supranational financial consulting group. Its reports are available from Group of Thirty, 1990 M Street NW, Washington, DC 20036 (phone: 202-331-2472, fax: 202-785-9423).

in the interim prior to maturity was not relevant to their business. Clearly, more work is needed by these users before they can be comfortable that they have properly evaluated all the risks.

Of course, the easiest solution to the problem of managing derivatives internally is not to use them. Such an approach unwisely skirts the whole issue of risk management, however. So, investment managers will be doing a lot more work on internal control of derivative products in the future.

Conclusion

Derivative products offer a means of improving performance and increasing flexibility. Potential return enhancement comes from lower trading, custodial, and clearing charges, investing cash surpluses, and no dividend withholding. Derivatives offer investors flexibility by allowing adjustment of country exposure, independent management of currency exposure, and asset reallocation within and between countries at low cost.

As with any other financial instrument, there are risks associated with derivatives. Firms can reduce these risks through careful internal control. For that purpose, the following checklist can serve as a reminder of things to do whenever possible:

- Use market-value measurements.
- Use scenario analysis.
- Consider risk in a portfolio context.
- Look for concentrations in exposure.
- Assume markets will be highly correlated in crisis situations.
- Place position limits on the basis of potential loss simulations.
- Analyze liquidity risks by incorporating wide bid–ask spreads into valuation.
- Analyze credit risks.
- Analyze legal, contractual, and oversight risks.