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Pensions & Investments
The International Newspaper of Money Management

October 13, 1997

Crash showed danger of 'insured' assets

Fragility of market highlighted

The following reproduces two of the chapters from the newly completed book on the Oct. 19, 1987, stock market crash, Capital Ideas and Market Realities: The true story of the crash of 1987 and the lessons we have (and haven't) learned.

The author, Bruce I. Jacobs, principal and co-chief investment officer of Jacobs Levy Investment Management Inc., Roseland, N.J., hopes to have the more than 400-page manuscript published next year.

An article on the book was published in the Sept. 27 issue of Pensions & Investments.

The chapters excerpted here discuss the risks posed by certain investment vehicles and strategies that he asserts caused the record one-day fall in the market 10 years ago and that exist in similar investing approaches today in the market. The bibliographical references, which appear in the book, have been cut from the excerpt.

His work is 1997 Jacobs Levy Equity Management Inc.

CHAPTER 15:
SONS OF
PORTFOLIO INSURANCE

We felt ultimately that demand for hedges would persist.

- John O Brien, 1993

On the one hand, the crash of 1987 highlighted two major problems with portfolio insurance as carried out by dynamic asset allocation. First, it showed the strategy of self-insurance upon which synthetic portfolio insurance rests is not insurance in the true sense of the word; the market declined to serve as the guarantor of insured portfolio value. Second, the crash made manifest the latent danger large amounts of insured assets pose for market liquidity and stability.

On the other hand, the crash if anything increased investors awareness of the potential fragility of the market, and their consequent desire for protection.

The financial community has taken two basic approaches in responding to the revealed problems with synthetic portfolio insurance and the continuing demand for asset protection. One approach has been to fix portfolio insurance itself, generally by means of innovative trading structures. The other approach has been to develop new financial products that can provide the protection portfolio insurance promised while avoiding the pitfalls. This chapter examines some of these solutions.

Sunshine trading

When synthetic strategies were first introduced to the financial community, insurance buyers signed up in droves, but no efforts were made to sign up offsetting sellers of insurance. Could insurance-induced order imbalances, such as occurred during the 1987 crash, be reduced by a better match between insurance buyers and sellers? Fischer Black and Erol Hakanoglu have proposed a clearinghouse for insurers, which would explicitly match insurance buyers and sellers trades.

Not long after the crash, Robert Ferguson and John O Brien proposed matching buyers and sellers through stabilizing forwards. Portfolio insurers and their counterparties (market timers and others willing to commit to a limit buy order if the market were to decline or to a sell order if it were to rise) would enter into binding agreements to trade stock index futures at prices agreed upon in advance, if and when the market reached specified levels. These forward contracts would, in effect, pre-sell the trading needs of insurers at pre-negotiated prices. If the market experienced a major decline, the contracts would provide the insured portfolio with the specified protection. Such protection would not require dynamic hedging, or its asso-

ciated trading, so it would have no impact on the market in periods of price declines (or price rises, for that matter).

A more indirect approach would be to advertise insurers intentions, what is known as sunshine trading. In his 1991 book, Financial Innovations and Market Volatility, Merton Miller noted:

Many observers believe, with some justification, that massive liquidations by portfolio insurers overwhelmed the normal marketmaking capacities of both the New York Stock Exchange and the Chicago index futures and options exchanges. The selling pressure was further intensified, some believe, by the public's inability at the time to distinguish adequately between informationless trades by portfolio insurers and those of informed investors.

Mr. Miller asserts pre-announcement of insurance sales during the crash might have encouraged the prompter participation of buy-side traders.

Writing in the 1990 American Economic Review, Gerard Gennotte and Hayne Leland demonstrated insured assets amounting to 5% of the market can set off a market decline of 30%, if the market is completely unaware of insurers trading intentions. If, on the other hand, the market is fully informed of insurers intentions, Messrs. Gennotte and Leland predict a drop of only 1%. They recommend wider dissemination of knowledge about hedgers intended actions through pre-announcement of trading requirements.

Steve Wunsch's proposal for sunshine trading aims to reduce the destabilizing impact of insurance trading through advertising insurers intentions. Under this scheme, insurers voluntarily would announce their intentions to trade. In a similar vein, Sanford Grossman suggests insurers be permitted to publicize their trading needs at various market levels.

As insurers are informationless traders, they arguably have nothing to lose by revealing their trading plans. And if insurers trading intentions were fully anticipated, market timers and other sellers of insurance could commit more resources to accommodating their trades. Its advocates claim sunshine trading could stabilize the market by curtailing unanticipated demands for liquidity. They point to the U.S. Treasury auctions as an example of successful pre-announced trading.

Some critics, however, maintain sunshine trades would attract front-runners. Front-runners trade in anticipation of large-volume trades that have the potential to change prices; by buying before an expected large purchase, for example, they may be able to reap a profit if the purchase raises prices even higher. Front-runners can destabilize markets when they trade in tandem with trend-following strategies such as synthetic portfolio insurance.

Anat Admati and Paul Pfleiderer, in the 1991 Review of Financial Studies, examined sunshine trading in the light of a rational expectations model with three groups of traders: liquidity traders who pre-announce trades, liquidity traders who do not pre-announce, and speculators with varying levels of information.

They find that, when information is heterogeneous and speculative trading is not costless, sunshine trading encourages the entry into the market of speculative traders in times of greater demand for liquidity. The larger the size of the pre-announced orders, the higher the proportion of speculators who will enter the market and trade, providing liquidity.

In 1992, Mr. Wunsch put his sunshine trading concept into practice with the launch of the Arizona Stock Exchange. Participants in this electronic single-price call market, all institutional investors, log onto the exchange's computer for its daily hour of business. In that time, they reveal their trading intentions, listing the stocks and the prices at which they wish to buy and sell. They can then observe the orders of other participants and reconfigure their own orders as they see fit. At closing, the computer matches as many trades as possible.

Sunshine trading, by revealing the demand for insurance, could reduce problems related to information aggregation and may encourage portfolio insurance counterparty trading. To the extent it encourages investors to take the other side of insurance trades, sunshine trading may ameliorate another major problem highlighted by the 1987 market break - the failure of portfolio insurance strategies to perform as expected. The chaotic conditions during the crash (to which portfolio insurance itself contributed not a little) made it impossible for many portfolio insurers to move from equities into cash positions in time to prevent substantial violations of their floors. The decade since the crash has seen the emergence of a number of new financial instruments and strategies designed to offer more dependable protection of equity portfolio values. Below, we look at some examples of what might be called the sons of portfolio insurance.

Supershares

Leland O'Brien Rubinstein's Mr. O'Brien (quoted in Forbes, Feb. 15, 1993) admits the stock market crash of 1987 and its aftermath was a very difficult time for our firm. But we felt ultimately that demand for hedges would persist. In 1992, LOR brought to the public exchanges a product that offered more solid downside protection for insurers and less instability for markets. Building on Nils Hakansson's concept of a superfund, LOR's SuperTrust offered exchange-traded mutual fund shares that could be broken out in several ways according to investors' desires for capital gains, downside protection or current income.

The idea of divisible equity shares had been marketed previously in the form of Americus Trust units, which were available for some five years beginning in the mid-1980s. Americus Trust units were finite-life instruments redeemable into shares of the underlying common stock and fully collateralized by common stock

held by the trustees. Purchasers of units, however, could choose to convert their units into either PRIMEs or SCOREs. PRIMEs offered income in the form of dividends on the underlying stock, plus varying degrees of participation in the stock s appreciation over the terms of the trust. Provided the underlying share value at termination did not exceed a pre-determined termination claim value (equivalent to a strike price), PRIME purchasers received a full share of common for each PRIME; if the value at termination exceeded the termination claim, purchasers received a fractional share equal to the ratio of the termination claim value to the closing price of the common. SCOREs entitled their purchasers to all of the capital appreciation on the underlying shares over and above the termination claim.

Whereas the underlying securities for PRIMEs and SCOREs were the shares of a small number of individual corporations, LOR s SuperTrust rested on two broad-based market funds. Shares in the trust, which were fully redeemable, were convertible into two SuperUnits traded on the American Stock Exchange. One unit, the Index SuperUnit, represented a share of an index fund based on the S&P 500; the other, the Money Market SuperUnit, a share of a money market fund. Both had a three-year life and earned the dividend and interest payable on the underlying assets.

Each unit could in turn be divided into two complementary SuperShares that were listed on the Chicago Board Options Exchange. Complementary shares of a unit could be traded separately or recombined into the unit and sold on the Amex or redeemed. The sum totals of their payoff patterns equaled the total payoffs of the underlying assets, and the shares were fully collateralized by the assets in the funds.

The SuperTrust allowed investors to pick and choose between shares in order to emphasize income, equity market exposure or protection. For example, the index unit split into a Priority SuperShare and an Appreciation SuperShare. The former received the dividends earned by the unit plus the total capital gains at the end of its life of up to 25% of original value. The latter earned the capital gains in excess of 25%. Appreciation SuperShares were thus the equivalent of a three-year call option on the S&P 500 index, rising in value when the market rose above the strike price (index appreciation of 25%), but with the possibility of expiring worthless after three years if the index did not appreciate by more than 25%.

The Money Market SuperUnit broke down into a Protection SuperShare and an Income and Residual SuperShare. The former received the capital value lost by the index unit after three years, if any, up to a maximum of 30%. The latter received all interest due the money market unit, plus the residual of its final value after the protection share was paid off.

Protection SuperShares thus offered downside protection, acting as a three-year put option on the S&P 500 index, and appreciating in value when the market fell below the strike price (the starting value of the index). Of course, this option also could expire worthless. But Mr. O Brien advised in an April 1993 marketing letter that it could be an important hedging security for your general equity portfolio.

Because they were based on market indexes, SuperShares provided a more appropriate vehicle for overall portfolio management than PRIMEs and SCOREs. Furthermore, the addition of the money market component introduced the ability to hedge against actual market declines, which SCOREs and PRIMEs alone could not provide.

SuperShares also offered advantages over synthetic portfolio insurance. Exchange listing, because it fully reveals prices, hence demand, should encourage liquidity. SuperShare prices were determined by the competition of investor demands. Investors desiring protection against market declines would have purchased protection shares; others, looking for exposure to an index fund, would have bought appreciation shares. If the demand for protection rose, perhaps as the result of market pessimism, the cost of the protection shares also would rise. Share prices thus should have revealed fully the demand for and the cost of protection.

Price transparency, exchange listing, and the unit sizes of shares (small enough to appeal to retail investors) should have encouraged the participation of traders willing to provide the liquidity needed by institutional hedgers. This in turn would have made markets less susceptible to the problems of instability posed by synthetic insurance. Stability also would have been enhanced by the fact that, beyond initial purchase of the shares, no further trading was required to achieve protection over a given horizon, even in volatile markets.

The ultimate value of LOR s SuperTrust for investors desiring to hedge against market declines depended on its success in attracting enough speculative investors and active professional traders to ensure secondary market liquidity. Unfortunately, what SuperShares failed to offer was simplicity. And, indeed, their initial reception and subsequent performance were less than royal. LOR had planned to launch with $2 billion in initial subscriptions, but ended up settling for $1 billion in commitments, mainly from large institutional investors. The SuperTrust was not renewed after its initial three-year run.

Options reborn

Publicly traded options offer numerous advantages over the synthetic strategy when it comes to providing protection. They do not require selling into a falling market, as portfolio insurance does. Real put options are thus not susceptible to replication failures because of volatile or discontinuous markets.

Insurance through publicly traded options offers another advantage over dynamic strategies: trading intentions are not masked. The market is thus not destabilized by unanticipated insurance trading demands. Because the selling pressure associated with puts is fully revealed, the puts are priced at a level that attracts natural partners. As Mr. Miller asserts in the 1992 Journal of Applied Corporate Finance:

The potentially destabilizing impact of portfolio insurance is much reduced when carried out with index options. .*. *. With exchange-traded puts, the bearishness in portfolio insurance would make its presence known immediately in the market prices and implicit volatility of the puts.

But dynamic hedging came about in part because portfolio protection via publicly traded options faced insurmountable obstacles. First, exchange-traded options were only available for certain standardized strike prices and expirations, and their time horizons were fixed and generally quite short. While one could have used a series of publicly traded short-term options to provide protection over the long run, one would not know the cost in advance, as it would depend on market volatility at the times the options were rolled over; the ultimate cost could be substantial.

Second, the maximum position limits imposed by the Securities and Exchange Commission reduced the usefulness of exchange-traded options to large institutional investors. Gary Gastineau, in a 1992 Journal of Portfolio Management article, suggests insurers need not have traded stock and futures during the 1987 crash if they had been permitted to have large positions in listed options: Long puts or calls would have cut their stock exposure automatically, and given them time to analyze the risk of the market - without the necessity to trade. An efficient option market with no position limits might have attracted portfolio insurance buyers and sellers to a trading and risk management mechanism designed to price and redistribute the impact of market volatility.

The shortcomings of synthetic portfolio insurance and exchange-traded options, made evident by the 1987 crash, opened the door for the development of an array of customized, over-the-counter vehicles to meet institutional investors hedging and other portfolio management needs. Taking its cue from OTC customized interest rate, currency and commodity contracts (pioneered in large measure by the Europeans), the U.S. financial services industry has, in the decade since the crash, developed and marketed a wide range of OTC equity derivatives.

Institutional investors who do not see what they need on the menu of exchange products increasingly are joining the stampede to the OTC market where, it seems, they can achieve just about any desired payoff pattern (or combination of patterns), as long as a counterparty can be found to provide it.

One of the most popular equity products suitable for use in insurance strategies has been the OTC option. This is a privately negotiated contract between two parties - the option writer (usually an investment bank, bank subsidiary or broker-dealer) and option buyer (typically a large institutional investor). Because the counterparties design the option to meet their own specific needs, it can be based on any agreed upon underlying stock, stock portfolio or index; strike price; maturity date; and exercise style (European or American). OTC options can be tailored to the investor s particular exposure and protection requirements and offer maturities and capacities not available on the listed options markets.

Further elaborations on the simple option concept are provided by so-called exotic options, including barrier options, average rate options, relative performance options and lookback options.

The payoff on barrier options is contingent, not only on the underlying security s price at exercise, but on that price s achieving or not achieving a specified level before expiration; a knock-in option may reach expiration in the money, but nevertheless expire worthless if the underlying security fails to pass a specified barrier over the course of the option s life, whereas a knock-out option will become worthless if the underlying security passes a specified barrier.

The payoff on an average rate, or Asian option depends on the average price of the underlying asset over the specified period. Both barrier and average rate options generally are less expensive than their more orthodox counterparts because they offer less opportunity of payoff or a more limited payoff.

Relative performance and lookback options are generally more expensive than regular OTC options because they allow their purchasers more possibility of payoff. The relative performance option, for example, pays the difference between two underlying assets, whether stocks, stock baskets, or indexes; even if both decline (or rise), the option holder will receive a payoff as long as relative performance turns out as expected. A lookback option allows the purchaser to choose the option s strike price on the basis of the underlying asset s prices over the option s life.

OTC options suffer from several disadvantages relative to listed options. In the absence of a secondary market, OTC options are substantially illiquid and more difficult to value. They also are customized instruments, hence more expensive (although increasing competition among financial intermediaries has driven down prices of those options with the most common specifications). Finally, since there is no exchange clearinghouse

providing a financial guarantee, holders of OTC options face the risk of counterparty default.

Expanding the listed option menu

Spurred by the mushrooming volume (and profits) in OTC markets, the exchanges themselves began in the late 1980s and early 1990s to offer options that were more suitable to institutional investors needs. Ironically, the Amex introduced three-year, European-style options on the Institutional Index the morning of Oct. 19, 1987. And in early November 1987, the CBOE began trading options on the S&P 500 with a two-year maturity. In October 1990, the Option Clearing Corp. began to issue LEAPS - Long-term Equity AnticiPation Securities - two-year puts and calls on a select number of individual securities as well as the S&P 100, the S&P 500 and the MMI. These basically were aimed at individuals and speculative traders, however.

In early 1993, the CBOE announced plans for flexible options geared to institutional investors (initial transactions of at least $10 million of notional principal on the S&P 100 or 500). FLEX options allow customization of contracts for the underlying index (S&P 100 or S&P 500), expiration date (up to five years), strike price, exercise style (American, European, or capped European), and settlement value (expiration-day opening, closing or average price). Like other exchange-traded instruments, FLEX options enjoy the credit guarantee of a clearinghouse (the Option Clearing Corp. in this case); price transparency; and an established secondary market.

Purchase of puts, whether exchange-traded or OTC, requires payment of a premium up front, whether or not the option is eventually exercised. The fallacious assertion made for synthetic portfolio insurance - that it would offer comparable protection at little or no cost - has more lately been heard on behalf of option collars. Zero-cost collars became particularly popular in early 1991. Estimates of the total stock value covered by it in that year range as high as $25 billion.

With a collar, the investor purchases an out-of-the-money index put option and pays for it by selling an out-of-the-money call option. The strike price of the put option serves as the floor for the portfolio s value, while the strike price of the call option represents a cap on the portfolio s value. A well-designed collar may indeed cost nothing at the time of purchase. As with portfolio insurance, however, its true cost becomes apparent only after the fact. If the market rises beyond the cap, the opportunity cost is the performance gain the portfolio could have made but in which it is now unable to participate. Complete surrender of returns beyond the cap might turn out to be a substantial cost to pay for a zero-cost collar.

In addition to OTC and exchange-listed options, the past decade has witnessed tremendous growth in other vehicles designed to offer option-like payoff opportunities, including synthetic warrants, swaps, and option-embedded bonds, or embeddos. These vehicles are suited to investors desiring to speculate on market movements, to attain index-like returns at low cost, or to achieve otherwise unattainable exposures to certain markets. They also can be used to hedge against downside moves, hence may play a role in certain portfolio insurance strategies.

Warrants

Synthetic warrants are similar to, but distinct from, both publicly traded and OTC options. Synthetic warrants are options that trade on public markets, but they are issued by individual corporations, financial institutions or governments rather than exchaes. Consequently, as with OTC option contracts, the investor must look solely to the issuer for payment, not to an exchange or clearinghouse.

Traditionally, warrants have been issued by individual companies in conjunction with equity or debt issues; they give the investor the right to purchase additional equity or debt at specified prices at some future date and allow the company to lower its funding costs. Such traditional warrants have been particularly popular in sustained bull markets such as the U.S. experienced in the 1920s and Japan in the 1980s. Whereas companies issuing warrants can create additional shares as warrants are exercised, the issuer of synthetic warrants must have the underlying assets on hand or purchase them to deliver as demand dictates.

Broker-dealers have issued synthetic call and put warrants on individual stocks and on indexes. Among the more popular warrants were those issued on the Japanese and other foreign market indexes.

In early 1990, the Kingdom of Denmark, Salomon Brothers and Bankers Trust issued put warrants on the Nikkei index, which were listed on the Amex. These (like LOR s Celebration Fund) offered protection against decline for a portfolio of Japanese stocks, and allowed bets against the Japanese market. Although these products (especially the Nikkei puts) have been used primarily for speculative purposes, some institutions have used warrants to hedge their international portfolios.

Firms that issue such warrants may hedge themselves against market risk by using a number of trading strategies, including dynamic hedging. An April 17, 1990, Wall Street Journal article noted:

Without these and other strategies to hedge the puts, issuers would have risked losing hundreds of millions of dollars in the recent plunge in Japanese stock prices. The put issuers execute the portfolio insurance strategy primarily by purchas-

ing and selling Nikkei futures contracts on the Osaka and Singapore stock exchanges.

Swaps

Swaps have gained huge popularity in the interest rate and currency markets. Swaps are contracts between two counterparties to exchange a series of cash flows. A simple example might be an issuer that swaps the fixed-rate interest payments on a new bond issue for floating-rate payments, or dollar-denominated bonds for bonds in other currencies. With equity swaps, one or both of the flows are linked to the performance of an established equity index or basket of stocks. The investor generally exchanges a fixed or floating interest rate for the dividend and capital appreciation on the stock index. An investor with a stock portfolio, however, can overlay it with an equity swap, paying out the dividends and any capital gains on the stocks in exchange for receipt of a fixed rate of return.

Bankers Trust initiated the first reported equity swap in 1989. Swaps are now a booming business and, to some observers, a potentially destabilizing one.

Gerald Corrigan (in the New York Times, Feb. 9, 1992), for example, has suggested some of the specific purposes for which swaps are now being used might be quite at odds with an appropriately conservative view of a swap, thereby introducing new elements of risk or distortion into the marketplace.

An example of a less-than-conservative use of swaps might be a corporate investor that gains equity exposure by investing in a fixed-income instrument and then swapping the returns for those from a stock market index. In such an exchange, the note enters the corporate balance sheet as an asset, but the swap does not have to be reported on the balance sheet, hence does not appear as a liability.

Furthermore, a dealer engaged in a swap probably will want to hedge any market exposure incurred. This may be done by undertaking a matching swap with another counterparty. But if such an opportunity is unavailable, the dealer may engage in a dynamic hedging strategy in order to lay off its market exposure.

Option-embedded bonds

In the spring of 1993, Citibank began marketing a stock index insured account, primarily aimed at retail investors. The account offers: Stock market returns. Zero risk to principal. Citibank promised returns on a five-year deposit of twice the average monthly increase in the S&P 500 index.

Deposit and debt instruments with embedded options, or embeddos , (also called bond-call structures or market index notes) offer insurance of principal with an option sweetener. The coupons and/or final principal payments of these products are linked to U.S. and foreign equity, fixed-income or commodity indexes. In effect, the investor is buying a bond or CD with a call option on a given index.

Embeddos offer investors participation in equity returns with a bond-like risk level. Investors proscribed from holding equities, or from holding more than a certain amount of equities, may constitute the most natural clients for these instruments. With their potential to protect principal while allowing participation in market gains, embeddos also may appeal to the portfolio insurance clientele.

Issuing banks hedge the risk of an excessive market rise by purchasing protection from other financial intermediaries in the form of OTC index options. The option writers in turn presumably hedge, perhaps with a dynamic strategy. Embeddo-like instruments had stopped being widely marketed right after the 1987 crash, because issuers had lost so much money on their risk management transactions during the crash.

Summary

The 1987 crash demonstrated that synthetic portfolio insurance does not work in the face of market illiquidity and price discontinuities and, further, that it actually can destabilize markets, making a collapse more likely. A number of instruments and approaches developed since the crash aim to sidestep the pitfalls of synthetic portfolio insurance while meeting investors demands for portfolio protection.

Sunshine trading supposedly would encourage liquidity and reduce problems of information aggregation by providing an arena in which portfolio insurers pre-announce their trading intentions. New option and option-like instruments traded on the public exchanges may go even further toward reducing potential market instability and increasing assurance of portfolio protection. LEAPS and FLEX options, for example, offer the guarantee of the exchange clearinghouse, plus full price transparency.

OTC options offer more flexibility for insurers than even the newer exchange-traded options, but because these instruments are privately negotiated contracts, there is no clearinghouse to guarantee them. Furthermore, although an insurer that buys an OTC put will not have to sell into a falling market (or buy into a rising market) to establish the desired level of protection, the broker-dealer or other financial intermediary that has issued the option might have to engage in such dynamic trading in order to hedge the exposures it has taken on. As with synthetic insurance, the extent of such trading will not be revealed to the market.

CHAPTER 16:
THE ENDURING RISKS

Continued rapid growth of derivatives contracts at the pace of the past several years would begin to raise the mania flag. Even in a global financial marketplace there must exist a finite limit to shiftable risk.

- Jerry Jordan, 1995

As a method of hedging against declines in portfolio value, exchange-traded and OTC options offer several advantages over synthetic portfolio insurance as implemented with dynamic hedging. First and foremost, these option instruments are binding contracts, rather than strategies implemented as circumstances demand and allow. The option holder is thus assured the purchased level of protection - as long as the option issuer remains solvent.

Second, the price of protection is known up front. Unlike synthetic portfolio insurance, where the cost will reflect the volatility experienced over the life of the insurance strategy, option prices are set, either by competition in the listed option markets or by issuers of OTC options, to reflect the volatility expected over the life of the option. Whereas portfolio insurers using dynamic hedging assume the risk that volatility may be greater than expected, purchasers of portfolio puts shift this risk to the option counterparty.

Third, to the extent that it requires less trading of assets and to the extent that the demand for and the cost of protection are more transparent, portfolio insurance undertaken with options may pose less of a threat to market stability than portfolio insurance undertaken via dynamic hedging. Whether these conditions hold remains a moot point. There are at least two major reasons for concern.

One concern is that information about privately negotiated OTC options is not as readily available as that on exchange-traded options. For exchange-listed options, trading volume and price are a matter of public record. But where can one turn to get information about private OTC contracts? For corporate reporting purposes, most derivatives contracts are considered off-balance-sheet, hence not included in financial statements, except perhaps in a footnote. (The Financial Accounting Standards Board says it is going to begin requiring companies to report the fair market value of derivatives contracts on corporate balance sheets, staring Dec. 15, 1998; gains or losses on derivatives used for hedging may be reported in earnings in the same period in which gains or losses on the underlying hedged positions are recognized. Any improvement in market participants awareness of the demand for portfolio insurance brought about by the increased use of listed options must be balanced against the lack of information about portfolio insurance using OTC options.

A second concern is the nature of the hedging undertaken by a dealer selling OTC options. In particular, the issuer of such options may itself use dynamic strategies to hedge the risks it has assumed. As John O Brien said in the July 1993 Wall Street & Technology: that organization usually is doing what suppliers of portfolio insurance were doing before 1987.

Unlike the pea in the notorious shell game perpetrated on unsuspecting tourists in the Big City, the risk covered by portfolio insurance puts is not so easily made to disappear.

Risks to insurance buyers

For exchange-listed options, the exchange clearing corporation serves as guarantor of the contract. With risk of default diversified across all exchange members, there is little likelihood that a put purchaser will be unable to exercise the option because of counterparty insolvency. With OTC options, however, the counterparty is no longer an exchange, but the individual issuer (generally a securities dealer). While it may remain unlikely any one firm will default over the life of any given contract, there is obviously a greater possibility of default for an individual firm than for the amalgam of firms constituting an exchange.

For the investor that has only a single counterparty contract, there is an ever present danger of that counterparty going under. The credit quality of one s counterparties is thus of prime concern for insurers purchasing OTC options. Wall Street firms suffered a steady deterioration in credit quality in the 1980s, as measured by Moody s and Standard & Poor s ratings. Declining credit ratings hampered firms ability to attract customers in the lucrative area of OTC derivatives (including equity options, but most especially the much larger markets in interest rate and currency swaps and options).

Some firms sought to ameliorate this problem by setting up special purpose vehicles, independent subsidiaries designed to deal only in OTC derivatives. SPVs are run by their own managers and directors, separate from those of the parent company, and are subject to special operating and accounting safeguards and ongoing independent audits.

Most importantly, their levels of capitalization are high enough to justify superior credit ratings.

Goldman Sachs Financial Products International, Merrill Lynch Derivative Products and Salomon Swapco all have obtained triple-A credit ratings. Thus buyers of OTC options for insurance purposes can feel reasonably comfortable their options will be honored, provided they monitor the credit ratings of their counterparties and seek to purchase options only from entities with superior ratings.

OTC option issuers, of course, will charge a premium for shoulder-

ing the risks that put purchasers lay off. Barry Schachter notes that one issuer he examined sold OTC options at price levels 45% above their theoretical values. In other words, the customer was being charged almost 11/2 times what it would cost the issuer to assemble or replicate an option position affording the specified level of protection. And, unfortunately, a portfolio insurance purchaser may find its attempts at comparison shopping thwarted, for two reasons.

First, OTC options are essentially proprietary vehicles tailored to the needs of individual customers. Prices are not publicly quoted and, even if they were, noncomparability across different options would make price comparisons difficult. Seha M. Tinic, in a 1995 article in the Journal of Financial Services Research, says issuers themselves price the options according to sophisticated theoretical financial models, which rely heavily on the ability to decompose complex contracts into such simpler components as options, futures, forwards, etc., for which the information necessary for valuation is widely available in the prices observed in the organized securities markets

Potential OTC option purchasers must perforce seek recourse to the same methods in order to determine whether they are getting good value for their money.

In this endeavor, however, they (as well as the securities dealers selling the options) may find themselves stymied by the inadequacy of today s option pricing models. In a 1989 Journal of Applied Corporate Finance, no less an authority than Fischer Black has said:

The Black-Scholes formula is still around, even though it depends on at least 10 unrealistic assumptions. Making the assumptions more realistic hasn t produced a formula that works better across a wide range of circumstances.

One of the more obvious disparities between modeled and actual option prices is the so-called volatility smile. That is, the Black-Scholes formula allows one to estimate the volatility of the underlying market by plugging in known market prices for options, their strike prices and their expiration dates. According to Black-Scholes, the volatility implied by this exercise in interpolation should be invariant to the precise relationship between option prices and their strike prices; that is, implied volatility should be the same whether an option is in, at, or out of the money. In the real world, however, implied volatility rises as the option s price moves away from the strike price - either into or out of the money - forming a smile pattern.

Mark Rubinstein, in the 1994 Journal of Finance, wrote the volatility smile is an outcome of the 1987 crash, a form of crash-o-phobia reflecting heightened awareness of the potential for outlier-type price changes and a consequent increased demand (and price) for protection. Jens Carsten Jackwerth and Mr. Rubinstein, using an optimization technique for estimating expiration-date risk-neutral probability distributions, find that the probability of a 3 (or a 4) standard deviation decline (in the S&P index) is 10 times more likely after the crash than before. Klaus Toft, in a 1994 paper, also sees the volatility smile as an outcome of the crash, but argues for an alternative explanation that pins the smile on an increase in overall financial leverage, as corporations were forced to issue more debt in the aftermath of the crash.

Attempts to develop option models that better reflect the actual behavior of option prices, including refinements of Black-Scholes, binomial tree and lattice approximations, and Monte Carlo simulations, constitute one of the hotter areas in finance today. It is not our purpose to go into these in detail, but rather to draw the reader s attention to their implication: option pricing is not a simple matter of plugging the right numbers into the right equations. The right equations (and the right numbers, for that matter) remain, to a non-trivial extent, matters of conjecture.

One substantial risk any purchaser of portfolio protection via OTC options must surely run is that of overpaying for a level of protection that could be attained at cheaper cost either from other OTC dealers or from exchange instruments.

Risks to dealers

OTC option issuers face their own versions of the risks confronted by the option purchaser. Furthermore, their risk-control task is complicated manyfold by the number and the variety of contracts in which they may be engaged. As we have noted, the value of OTC equity instruments is dwarfed by that of interest and exchange rate vehicles (including swaps, options, swaptions and forwards). The dealer selling OTC equity options designed to reduce the risk of one corporation s pension fund may also be intermediating an interest rate swap to reduce the cost of financing another s capital, and an exchange rate forward to reduce the risk of yet another s foreign operations or supplies.

While the volume and diversity of its counterparties necessarily make assessment of credit risk a more complex task for a dealer than for the typical end-user, they also afford the benefit of diversification. The typical dealer will be less susceptible to sustained damage from a default by any one of its multiple counterparties than will the end user with a limited number of counterparties. Furthermore, the dealer is more likely to be able to benefit by netting arrangements, whereby contracts with any given counterparty are pooled so that positively and negatively valued contracts offset each other. With netting, a counterparty cannot choose to default on those contracts under which it owes the dealer while continuing to collect on contracts under which the dealer owes.

Dealers of OTC contracts also generally apply a number of formal boundaries in order to control credit risk. These include limitations on exposures to individual counterparties and on aggregate exposures to given credit rating categories and to given countries of counterparty origin. Dealers, like end-users, will require that their counterparties have relatively high credit ratings. Vijay Bhasin finds the average credit quality of derivatives users was significantly better than that of all firms with senior debt ratings. He also finds, however, the gap between the credit quality of derivative users and the average rating of all firms has narrowed over time.

Mr. Bhasin does not look at contract specifications, which may contain requirements that mitigate the increases in credit risk. Dealers may require posting of collateral or periodically mark contracts to market in order to offset perceived increases in default risk because of counterparty credit quality or the nature of the contract. The International Monetary Fund s 1993 survey of banks issuing interest rate and currency derivatives found they were beginning to mark contracts to market and require periodic margin payments to offset the increased risk of their longer-term contracts. It also found securities dealers charged higher premiums, in the form of wider bid-asked spreads, when dealing with riskier counterparties.

Derivatives themselves may reduce the probability of a counterparty default. As Ludger Hentschel and Clifford Smith Jr. point out in the Journal of Financial Engineering in 1995, there are two necessary conditions for default: The counterparty owes a payment on its derivatives, and the counterparty is insolvent. They argue that, to the extent the derivatives are used to hedge (and not for speculation), the probability of counterparty insolvency will be reduced.

Credit exposure for dealers may also be ameliorated by the nature of the relationship between macroeconomic factors and the value of derivatives contracts (although this relationship may also serve to heighten exposure). As John Hull, in a 1989 Journal of Financial and Quantitative Analysis, argues in regard to interest and exchange rate swaps, if bankruptcy becomes more likely when interest rates rise, then the exposure of interest rate swap portfolios may be stabilizing insofar as the counterparty paying fixed and receiving floating generally has the higher credit risk. Gregory R. Duffee, however, in a 1994 Finance & Economics Discussion Series, finds that, historically, default is more likely in periods of falling, rather than rising rates, so credit risk is increased for the counterparty paying fixed.

The task of assessing exposure to credit risk is nevertheless a difficult one for dealers (as well as end-users), inasmuch as it involves not only estimating counterparty default probabilities over often multiyear horizons, but also estimating the potential behavior of the derivatives over changing economic environments. Shortcomings in available models as well as unavoidable errors in forecasting model inputs make valuation of derivatives far from an exact science. Standard & Poor s Credit Week of November 1992 noted: In general, the models and the systems capability for tracking credit exposure are in a catch-up mode, and have experienced difficulty keeping up with the growth of the business.

The chore is further complicated by the now seemingly ubiquitous use of derivatives: Participation in derivatives markets can cause firms to become connected through complicated transactions in ways that are not easily understood, making the evaluation of counterparty risk extremely difficult, according to an International Monetary Fund paper.

Dealers must also manage the market exposures associated with their derivatives positions. In selling a put on an equity portfolio, for example, a dealer places itself at risk of a market decline that will force it to purchase the securities at above-market prices, just as a dealer that enters into a swap to pay a counterparty a fixed interest rate in exchange for receiving a floating rate is at risk of a decline in interest rates leaving it with a negative cash flow. Many firms estimate the market risk of their derivatives positions (derivatives responses to changes in underlying markets) by estimating value at risk. This is the loss in value over a given horizon that may be exceeded with a small probability. VAR estimates rely on models of the probability distribution of returns and their volatility, and often take into explicit account the possibility of price jumps. Again, VAR estimates are only as solid as the models and variables used to derive them.

In some cases, dealers may choose to leave some portion of their derivatives-related market exposures unhedged. The Commodity Futures Trading Commission s 1993 survey of 14 OTC derivatives dealers found all held less than fully hedged positions, although all but one denied speculative intentions. Institutional Investor in 1990 reported outstanding derivatives positions allow some dealers to take positions in their own accounts without having to find the other side of the trade: Dealers say that as much as half of the profits from a derivatives business comes from this sort of trading rather than the initial bid-ask spread.

Typically, however, dealers will attempt to offset counterparty trades in order to control market exposures. With interest rates and currency swaps, for example, a dealer basically will serve as an intermediary between two counterparties, so that payments to (or from) one are mirrored by payments from (or to) the other. By breaking down all their transactions into the constituent cash flow components and aggregat-

ing these, dealers can attain an approximation of the residual market exposure of their overall derivatives portfolio. According to the Group of Thirty in 1993, Dealers . . . typically manage the market risks of their derivatives activity on the basis of the net or residual exposure of the overall portfolio. A dealer s portfolio will contain many offsetting positions, which substantially reduce the overall risk of the portfolio, leaving a much smaller residual risk to be hedged.

Undesired residual market risk must be hedged. The hedge may take the form of synthetic option replication via dynamic hedging, with the dealer holding and shifting futures positions, say, in response to its changing market exposure. The Group of Thirty describes the dangers thus: There are two main risks associated with a dynamic hedge. The cost of hedging may turn out to be greater than expected because actual volatility is greater than expected; and the hedge does not protect completely against gapped markets and prices may move significantly before positions can be adjusted. .*.*. Illiquidity can also be an issue for individual participants who hedge through a dynamic process. Sound familiar?

Rather than using underlying assets or futures to hedge their residual market exposures, dealers can use listed options. They will encounter essentially the same difficulties as with synthetic hedging, however. As listed options are generally of shorter maturity than OTC derivatives, and as the hedge position must be altered to reflect changes in net exposure, the option positions must be managed dynamically. The need for discrete rebalancing introduces the virtual certainty of replication errors and leaves the hedge portfolio open to the same dangers of market gaps and hidden costs that threaten dynamic hedging strategies.

In offsetting and hedging market exposures, issuers may find equity derivatives, particularly equity options, more problematic than currency or interest rate instruments, despite the fact that they make up only a small portion of all OTC contracts. For instance, it may be more difficult to find offsetting counterparties for equity options than for interest rate and currency swaps. Either side of an interest rate or currency swap, for instance, may be used to reduce risk, depending upon the nature of the user s cash inflows and outflows. In contrast, one side of an option trade is likely a speculative position. The ability to offset option positions may thus depend upon the presence of traders willing to take on that speculative risk.

Furthermore, the assets underlying equity derivatives are considerably more volatile than those underlying interest rate and foreign exchange rate derivatives. Benjamin Weston, managing director of Credit Suisse Financial Products, notes in an August 1990 Institutional Investor article:

If the underlying volatility of interest rates is a 1 and forex is a 2, then equity is about a 4. We manage our business on the basis of market-crash conditions, assuming that things can move 10 to 15 percent in a single day.

It may thus be harder to lay off the risk inherent in equity option positions than the lesser risk involved in rate-based options. And because they will certainly be more difficult to value, equity options may be more difficult to hedge, whether via dynamic trading strategies or listed options, hence more prone to replication failure.

Management of OTC derivatives requires complex mathematics and computer-based valuation and trading techniques. Operations are thus susceptible to computer and communications software breakdowns. They may also be difficult to track and control; often only the traders themselves can understand the complexity and risks of what they are doing. In an ironic twist to the story of portfolio insurance, in early 1993 Mr. O Brien and his colleagues at Leland O Brien Rubinstein began selling a software product that audits the black boxes that drive derivatives trading strategies.

Messrs. Hentschel and Smith, in the 1995 Journal of Financial Engineering, stress it is agency risks, including inappropriate incentives for traders, rather than credit risk that pose the greatest problem for derivatives market stability. Indeed, agency and oversight problems certainly were apparent in two of the most publicized cases involving derivatives-related losses. At Barings Bank, a single trader in the Singapore office lost $1.3 billion trading in futures on the Japanese market; the losses bankrupted the company. At Daiwa Bank in New York, a single trader lost an estimated $1.1 billion over an 11-year period. These disasters were enabled by the fact that the trader in each case was in charge of both the trading desk and the back-office operations that oversaw the trading operations.

Risks to markets

Market observers became very anxious about the potentially destabilizing effects of new derivatives products as the 1990s progressed. A number of governmental and quasi-governmental groups (including the Commodity Futures Trading Commission, the International Monetary Fund and the Group of Thirty) undertook studies and convened conferences to address this issue. Of particular concern was the possibility of difficulties to one derivatives user or dealer, or one market, causing, via the linkages created by derivatives themselves, widespread systemic failure. According to the International Monetary Fund: The tendency for derivatives to create arbitrage opportunities and to strengthen the linkages between markets has increased the possibility that disruptions or increased uncertainty in these markets might spread over

into other derivatives markets and into the cash markets more readily than in the past.

John Marshall, executive director of the International Association of Financial Engineers, argues to the contrary in a 1995 Journal of Financial Engineering:

The reality . . . is that the derivatives markets have weathered a major stock market collapse, a sharp rise in interest rates, several currency crises, and the failures of several major financial institutions - all without anything remotely resembling a systemic crisis. My own view, after much study and contemplation, is that derivatives are not a source of significant systemic risk. Precisely the opposite. They are a prophylactic, a preventative for systemic risk. Through widespread use of derivatives for risk management purposes, individual firms, industries, and indeed the integrity of the system as a whole is increasingly insulated from the vagaries of the market.

Franklin Edwards, of the Center for the Study of Futures Markets at Columbia University, points out in a 1995 Journal of Financial Services Research that concern with the threat of derivatives seems to rest on four characteristics -the magnitude of dealer counterparty credit risk, concentration of OTC activity among a few dealers, extensive linkages between dealers and between dealers and markets, and a lack of regulation of non-bank dealers. He notes the U.S. General Accounting Office has found dealers net credit exposure is less than 1% of the notional value of outstanding derivatives contracts; that the top eight U.S. dealers (seven banks, one security firm) account for only 33% of the worldwide notional value of derivatives held by dealers; that market linkages should increase liquidity and cushion local disturbances; and that non-bank dealers are well capitalized and, unlike banks, not beneficiaries of government deposit insurance, hence not a potential threat to government and taxpayer finances. Robert Easton, chief executive officer of the Commodities Corp., further notes in a Commodity Futures Trading Commission symposium, that derivatives market participants are sophisticated investors, as recognized in the Futures Trading Practices Act of 1992.

Peter A. Abken, in the 1994 Federal Reserve Bank of Atlanta Economic Review, cites the differential between revenue and losses after 10 years of derivatives trading ($35.9 billion in revenue, vs. cumulative losses of $19 million) and notes no commercial bank has failed as the result of derivatives trading. According to the CFTC s symposium: .*.*. when insolvent financial institutions have been wound up in the last few years, including DFC New Zealand, Bank of New England, British & Commonwealth Bank, and Drexel Burnham, the derivatives activities were either transferred or closed out reasonably quickly. In fact, the derivatives books were closed out more rapidly and in a more orderly fashion than the firms other traditional assets and liabilities could be liquidated.

The threat posed to the overall economy by the possible insolvency of a few derivatives dealers, however, might be secondary to the threat posed by derivatives-related trading to underlying markets. Already several incidents have signaled cause for concern. In 1994, for example, OTC dealers aggressively sold call options on European bonds as that market rose, hedging themselves by buying bonds; when prices turned down, dealers sold, adding to the considerable selling pressure from speculators who had bought on margin, in many cases with funds received from selling puts. A dealer at one European bank (quoted in the March 17, 1994, Wall Street Journal) described the result:

People sold in the (bond) market until prices got pushed too far, then in the bond-futures markets, then in the swap market. And then they started trying to hedge in other instruments - like selling German bonds to hedge losses in Italian bonds - until all the markets were rolling along in the same black hole.

Equity markets may be at even greater risk than bond markets, given their much higher volatility and the potentially greater mismatch between buyers and sellers of risk-reducing equity derivatives. There already have been some episodes of exaggerated market volatility resulting from the sons of portfolio insurance. The Japanese market decline of the early 1990s has been linked to writers of Nikkei put warrants. It is probable that this slow and drawn-out crash was exacerbated by program selling in the index futures market.

While the Nikkei put warrants weren t the cause of the Tokyo stock market s drop, . . . the computerized hedging programs backing them exacerbated the decline once it started and added to the market s volatility, according to an April 17, 1990, Wall Street Journal article.

Equity derivatives also can increase volatility on the upside.

Many of the zero-cost collars bought in early 1991 had proved to be expensive by the end of the year when the market soared through many investors established caps. This might have caused an additional market rise as stocks that had been called away were bought back. A number of traders described the way the market received an extra kick upward as reminiscent of portfolio insurance.

In short, portfolio insurance as conducted with newly available derivatives such as OTC puts may pose problems for equity markets similar to those posed by synthetic insurance strategies. The extent of this danger will depend in part upon the size of the demand for insurance and the willingness of market participants to supply that demand. Here again we can detect unhappy

correspondences to synthetic portfolio insurance.

First, the explosive growth in equity and other derivatives suggests to some a fad element similar to that detectable in the growth of synthetic insurance in the 1980s. In the Journal of Financial Services Research in 1995, Jerry Jordan, president and chief executive officer of the Federal Reserve Bank of Cleveland, noted:

The explosive growth of OTC derivatives contracts conceivably could be classified as a temporary mania, particularly from the point of view of those whose mismanagement has produced spectacular losses. With hindsight, marginal private cost was apparently seriously underestimated. Continued rapid growth of derivatives contracts at the pace of the past several years would begin to raise the mania flag. Even in a global financial marketplace there must exist a finite limit to shiftable risk.

As with synthetic insurance, faddish pursuit of equity risk control via listed and OTC options and other instruments may lead to unwarranted dismissal of the inherent risks of stock investments and encourage higher than warranted commitments to stocks. As demand for stocks pushes prices away from fair valuations, prices become more susceptible to correction.

Whether a major correction will pose a significant threat to equity markets may depend upon the hedging designs of OTC dealers. If a decline in overall market prices forces a substantial amount of selling by OTC dealers, liquidity problems may result. Illiquidity may be exacerbated if, as with synthetic portfolio insurance, uncertainty about the identity and extent of hedging sales diminishes the willingness of value investors, speculators and others to take the buy side in declining markets:

A paucity of reliable price information is viewed as potentially increasing liquidity strains because market-makers or other market users may be unwilling to commit capital to transactions without such data. The effects of price opacity upon liquidity may be particularly significant in the markets for highly customized, exotic instruments or for instruments of longer maturities due to the unavailability of a meaningful exchange transaction price as a reference price, according to an October 1993 report by the CFTC.

In the absence of willing buyers, OTC dealers dependent on the ability to lay off equity positions in order to hedge their put exposures are particularly vulnerable to loss. Of course, losses on equity positions may be offset by gains on other derivative positions. And even a default by a single dealer is unlikely to cause the systemic collapse feared by regulators if, as Messrs. Hentschel and Smith contend, defaults on derivatives contracts are approximately independent across dealers and over time.

As Mr. Jordan points out, however, The risk levels of all financial contracts are interdependent in that they jointly depend on the state of the aggregate economy. Derivatives and dynamic strategies such as portfolio insurance may transfer risk, but they cannot eliminate it. The ability to transfer risk is finite. Strategies that presume otherwise are fated to fail, if not sooner then later.

Summary

Exchange-traded and OTC options have several advantages over synthetic portfolio insurance conducted via dynamic hedging. First, the option seller (backed, in the case of publicly traded options, by the exchange clearinghouse) guarantees the purchased level of protection will be there if needed. Second, the purchase price is known up front and not dependent upon subsequent volatility in the underlying asset. Third, to the extent they do not require selling into falling markets (or buying into rising markets), and to the extent the demand for protection is publicly revealed, options may pose less of a threat to market stability.

But the newer forms of portfolio insurance cannot, any more than synthetic insurance could, eliminate the risks of stock investing. OTC options in particular may pose hazards to insurance buyers, insurance issuers and the market as a whole.

Prices of privately negotiated OTC instruments are not publicly available to facilitate comparison shopping. Both users (and issuers) of these instruments must rely on theoretical models of questionable reliability. Insurance buyers thus face the risk of paying substantially more for portfolio protection than it is worth.

Issuers of OTC options face risks in the form of the market exposures they incur through their derivatives positions. Offsetting trades may be able to neutralize a large portion of the underlying market exposures of any given issuer, but some residual exposure is bound to remain.

Unless the issuer wants to maintain a speculative posture, it will have to hedge using listed options or dynamic hedging. Dynamic hedging, of course, exposes the issuer to the same problems that confronted institutional investors using synthetic portfolio insurance and may pose a similar threat to market stability.

Faddish pursuit of portfolio protection may lead to unwarranted dismissal of the risks inherent in stock investing and to a consequent increase in the demand for stock and to stock prices rising above fundamental levels. At the same time, extensive use of dynamic hedging by dealers attempting to hedge their option-related market exposures (especially given the lack of information about the volume of such hedging) may create the same information aggregation and liquidity problems that proved so catastrophic in 1987.

In such an environment, the possibility increases that major derivatives users or issuers may face insolvency. And today, with the linkages that derivatives have forged between firms and between markets, the problems may not be confined to a few firms, or even to the stock market alone.