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Option replication and the market's fragility

By Bruce I. Jacobs

Have institutional investors learned the lesson of October 1987, to wit, the dangers posed by option-replication strategies such as synthetic portfolio insurance? With the market trading at the 9,000 level, is anyone even thinking about it?

Paul G. Barr's article "The fear of hedging" in the May 4 issue of *Pensions & Investments* suggests at least some have learned or are thinking about the lesson. But while many large investors seem to have spurned the idea of short-term portfolio protection via derivatives and stood by their long-term asset allocation policies, others have not resisted temptation. And the impulse for portfolio protection, as the Barr article notes, only grows stronger as the market reaches ever higher levels.

The article "Nobel-winning strategy criticized" by Barry B. Burr in the Dec. 8 issue presented some of my concerns about how an overreliance on index options for hedging and the consequent need for long-option replication can destabilize financial markets. I still believe option replication poses dangers to market stability, despite the current market's seeming obliviousness to gravity, and despite the counterarguments posed by Nobel laureates Myron Scholes and Merton Miller in the article.

BROKERS SELL NEW PROTECTION

The general advance in equity market prices since the 1987 crash has, if anything, increased the demand for OTC

options, for an expanded menu of listed options and for retail products promising equity participation with guaranteed protection of initial investment.

Many major U.S. brokerage houses now are offering retail clients a product that already has taken off in Europe -- option-embedded guaranteed equity investments. Advertisements by these brokers bear an eerie resemblance to the promos for portfolio insurance a dozen years ago. One campaign entices customers to have it both ways, and go for the earning potential of a rising stock market. But (do) not risk principal if the market declines. Unlike portfolio insurance, guaranteed products are backed by the issuer. Like portfolio insurance, however, they may create problems for the equity market, as the OTC dealers selling the options that back the products must hedge their own short positions using the same dynamic trading strategies portfolio insurers used.

According to the Bank for International Settlements, U.S. OTC equity options alone added up to some \$107 billion at the end of March 1995. Assuming this OTC market has grown by as much as the market for listed equity index options (and it is likely to have grown much faster), there would be about \$200 billion notional value in OTC equity index options in the United States today.

How much long-option replication is associated with an OTC market of this size? And what of the hedging demands of exchange market-makers? Are the demands great enough to pose a threat to market

stability? Professors Scholes and Miller would claim not. They claim options had nothing to do with the market's instability in October 1997. But, through much of the second half of that year, increasing investor demand for long puts had positioned dealers and market-makers on the short side of the options market (Goldman Sachs, *Global Derivatives/1997 Review-1988 Issues*, January 1998). This short volatility position would have required substantial hedging by them in underlying equity and futures markets. When economic woes in Asia triggered market downturns, selling by these hedgers undoubtedly contributed to the market's decline.

Given the current state of public disclosure on OTC options and on option-related trading in general, it is difficult to determine the precise contribution of such trading to recent bouts of market instability, let alone its potential for disrupting markets in the future. But if history is any guide, it tells us that levels of trend-following dynamic trading that might seem very small in relation to the overall market can have outsized effects.

LOW VOLATILITY, HIGH FRAGILITY

It is true, as Mr. Scholes observed in the Dec. 8 article, that the average volatility of the U.S. market has remained at historically low levels since the advent of option trading. But this apparent stability does not necessarily prove that option-related trading strategies have not had or cannot have destabilizing effects on the U.S. equity market. It is more likely

that it simply reflects the underlying influence of the remarkably steady growth of the U.S. economy since the early 1980s. Furthermore, if market prices keep moving in one direction, long-option replicating trades will follow suit; they are thus trend-reinforcing.

At the same time, these option replication strategies increase market fragility, undermining markets in potentially catastrophic ways. As overvaluation, fed by these trend-following strategies, grows larger, the market becomes increasingly susceptible to the inevitable piece of bad news that will set prices tumbling. This is because, when prices start to fall, the same replicating strategies that required more buying as the market rose will now dictate selling. And their selling can exacerbate and accelerate market declines.

Professor Scholes argued any mispricing caused by option strategies' trend-following trades could not persist for very long in a fundamentally efficient market. But one might question just how efficient the U.S. equity market is. The late Fischer Black, co-creator of the Black-Scholes option pricing formula, once noted that noise can cause prices to deviate by a factor of two from fundamental levels, without a market being considered inefficient. Say the Dow's current level of roughly 9,000 is fundamentally correct; the market would be considered efficient at any level between 4,500 and 18,000! This leaves a lot of room for over and under pricing in a fundamentally efficient market.

Fundamentals will always provide the underlying structure for the pricing of financial assets. Fundamentals exert a gravitational pull on market prices, so an overvalued market will tend to recede and an undervalued one rise eventually. But it may take some time for the tides to turn. For example, many market observers would argue the Japanese equity market was grossly overvalued throughout much of the 1980s.

MISPRICINGS DEFY ARBITRAGE

There are several reasons mispricing may persist for nontrivial periods of time without being "arbitraged" away by

informed value investors. Noise itself creates risk that informed investors might not want to take on. After all, selling against a rising market, or buying into a falling one, requires a great deal of conviction in your "fundamentals," and going against the trend can be costly rather than rewarding.

Indeed, U.S. equity markets in the 1980s and 1990s have been characterized by broad trending behavior interrupted by infrequent but large downdrafts, followed by fairly rapid recoveries. We saw this in September 1986, January 1987, October 1987, October 1989, November 1991 and, most recently, October 1997. The pattern is consistent with a market subject to mechanistic, trading-rule-induced breaks.

A CASCADE OF FORCED SELLING

A similar pattern played out in the 1920s. Margin buying (which, as Professor Miller noted in the Dec. 8 article, was a precursor to options) fed a huge market rise in the mid-1920s. Then a market turnaround led to margin calls and the forced selling of stock, which fueled the crash of October 1929. The market had started to bounce back from that initial decline, but succumbed in the early 1930s to misguided policy efforts that paved the way for the Great Depression.

That the forced selling of put-replicating portfolio insurers performed a similar role Oct. 19, 1987, when the market fell by 22.6%, seems irrefutable, despite the denials of Professors Scholes and Miller. While Professor Miller notes there always have been devices like stop-loss orders, what he fails to acknowledge is portfolio insurance amounted to a massive stop-loss order on the market portfolio, which ultimately led to devastating selling.

As Professor Scholes asserts, fundamentals undoubtedly triggered the initial decline. But in 10 years and untold hours of research, no one has been able to find any fundamentals that could begin to explain the full magnitude of the collapse on the 19th.

LIQUIDITY CRISIS

Professor Miller, and others before him, would argue that, because portfolio

insurance selling constituted only a fraction of total sales on the 19th, it did not contribute significantly to selling pressure. In fact, insurers accounted for a remarkably large percentage of sales on the 19th, especially considering that insured equities of about \$100 billion amounted to just 3% of the market's total capitalization. Insurers had an effect out of all proportion to their actual size both because they exerted an enormous selling pressure on the market and because their selling panicked other investors.

Selling by insurers accounted for a whopping 43% of public futures sales (sales exclusive of locals transactions) on the 19th, and stock sales by insurers accounted for almost 23% of large investors sales on the New York Stock Exchange that day. Furthermore, portfolio insurers were the only group of large institutional traders whose sales far overwhelmed their purchases in both the stock and the futures markets. Portfolio insurers not only sold 36 times as much as they bought in the futures market, they also sold four times as much as they bought in the stock market on the 19th (as their inability to sell in the futures market at other than sharp discounts forced them into the underlying market to curtail their equity exposures).

Portfolio insurers' sales net of their purchases on the 19th amounted to \$5.2 billion; that is, insurance selling alone accounted for almost a full day's average trading volume on the NYSE back then. Furthermore, on the basis of the magnitude of the market's decline and the size of the pool of insured assets, insurers replication rules would have called for selling \$25 billion in equity positions, some four days average trading volume. What magic wand could produce buyers, at a moment's notice, willing to fill this demand, especially as prices plunged discontinuously downward toward who knew what bottom?

Would there have been a liquidity crisis in the absence of portfolio insurance? Blaming illiquidity for the crash, as Professor Scholes does, mistakes the effect for the cause.