

# **D** THE JOURNAL OF **DERIVATIVES**

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**W**e live in volatile times. Looking for something to say about the 2002 election, I checked out the VIX index of the implied volatility of the Standard and Poor's 100 stock index on the following day, November 6. I was about to comment that, relative to long-run measured index volatility that averages 21% including the Crash of 1987, a reading of 34.48 suggests that not a lot of uncertainty had been resolved on the previous day. But then I looked back a little further, to see that, in fact, the VIX had hit an astronomical level of 49.48 less than a month earlier. Can we really be thinking that one standard deviation for the annual return on the largest stocks in the U.S. is more than 34%? It is a sobering thought.

Despite the enormous success of modern option pricing theory, both as a theoretical paradigm and as the framework universally used in real-world markets, the pervasive pattern of implied volatilities (IVs), known as the "volatility smile" or, in the stock market, the "skew," continues to be an empirical thorn in our theoretical sides. An underlying asset can have only one volatility, but market prices for the collection of options based on that underlying asset invariably display a regular pattern of IVs that differ by strike price, so we are left trying to understand why the markets in which everyone uses pricing models for trading options nevertheless regularly produce prices that are inconsistent with the theory behind those models. Do we just have the wrong models, or is the market offering arbitrage opportunities? Our lead article by Ederington and Guan presents a very nice demonstration that both seem to be true. Their testing procedure is simple, looking at returns to delta-neutral trading strategies in which options with low (Black-Scholes) IVs are purchased and those with high IVs are written. If such a strategy can produce excess returns, then we know that something is mispriced in the market, without having to say what the right prices are, or even which prices are wrong. In a careful and thorough investigation of S&P 500 index option pricing, the authors find their strategy produces statistically significant excess returns, but not as large as what would be predicted if the volatility smile were entirely due to mispricing. Whaley's article follows in somewhat the same vein, by looking at the performance of a covered call writing strategy using stock index options. Employing a new index of covered call returns published by the Chicago Board Options Exchange, he finds that since 1988, writing covered calls has been more profitable, with lower risk, than would be expected.

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A glance at the recent articles published in *JOD*, or in any of the leading research journals in finance, shows how much more complex option valuation models have become in the last few years. But as the economic environment assumed in the models becomes more realistic, allowing for stochastic interest rates, stochastic volatilities, asset price jumps, etc., the equations get more numerous, longer, and much more complicated. One simplifying technique that has now become standard practice is to change the numeraire in the problem. In our third article, Benninga, Björk, and Wiener explain how this technique works and offer a variety of examples that illustrate its power.

As stock prices drop, call options struck at prices that were originally close to at-the-money are now deep out-of-the-money. This makes options with the feature that the exercise price is reset to a lower value once the asset price falls past a given level very appealing. In our next article, Liao and Wang present a valuation approach for contracts with multiple resets, including the case of arithmetic Asian payoffs. Finally, Hung and Wang tackle the problem of pricing a convertible bond that is simultaneously exposed to interest rate risk, default risk, and possible conversion into the stock of the issuing firm. Rather remarkably, they are able to incorporate all three sources of risk into a single pricing lattice.

**Stephen Figlewski**  
**Editor**