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by James F. Meisner and John W. Labuszewski

Modifying the Black-Scholes Option Pricing Model for Alternative Underlying Instruments

The Black-Scholes option pricing model may be used to evaluate options on various types of underlying instruments, but significant modifications are necessary. In addition to financing costs, for example, the formula for commodity options must incorporate storage costs over the option's life, whereas the formula for securities must consider expected dividends or interest income. Conventional options on futures contracts, on the other hand, entail no holding costs. And the formula for "futures-style" options on futures must recognize that neither holding costs nor short-term rates are a factor in pricing.

These adjustments have implications for the "put-call parity" relationship, which provides information about the relative time values associated with puts and calls. For securities, put time value will exceed call time value if expected dividends or interest income exceed financing costs. In the case of conventional commodity options, call time value always exceeds put time value. The time value of a conventional put (call) on a futures contract will exceed call (put) time value if the call (put) options is in-the-money. Put and call time values are always equal for futures-style options on futures.

The authors provide a computer program, written in BASIC, for calculating "fair market" put and call option premiums for options on securities, commodities and futures.

MODELS FOR THE PRICING of options have proliferated as new types of option contracts have been introduced.[1] The common ancestor of all these models is the Black-Scholes stock option pricing model.[2] The Black-Scholes model, although based on assumptions that may be deemed overly restrictive for practical applications, is nonetheless the most widely known and referenced method for estimating "fair market" option premiums.

1. Footnotes appear at end of article

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This article demonstrates how the Black-Scholes option pricing formula is adapted for the valuation of four classes of options—(1) conventional (prepaid premium) options on securities (such as stocks and bonds), (2) conventional options on storable commodities (such as metals and grains), (3) conventional options on futures contracts, and (4) "futures-style" (margined premium) options on futures contracts. The modifications necessary to adapt the classic formula illustrate some of the basic differences between the instruments that may underlie an option contract. Put-call parity and option price sensitivity to changes in underlying parameters are considered within the framework of this

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