Stochastic volatility effects on static hedging

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Abstract

Hedging exotic options in financial market is an important work for the issuing financial instruments because the risk may cause huge losses for the financial instruments. The hedging methods are classified into two categories: the dynamic hedging approach and the static hedging approach. Our research is the latter. The static hedging approach is to form a portfolio with fixed weights of vanilla options, with varying strikes and maturities, which requires no adjustment in the future. Derman, Ergener, and Kani (1995, DEK) presented a methodology to hedge statically a large class of barrier options when an infinite number of vanilla options are available. This methodology is to set up a portfolio of vanilla options which replicates the barrier option's payoff as close as possible. However, the result of this approach is only valid in very special cases and the possible extension to more advanced models seems rather difficult. To overcome this weakness, we propose stochastic volatility model driven by a fast mean-reverting Ornstein-Uhlenbeck process and then apply our model to DEK method. Our numerical results indicate that our model improves performance of static hedging.

Keywords: Stochastic volatility model, Static hedging, Barrier option, Asymptotic analysis