PRICIING OF VOLATILITY-BARRIER TIMER OPTIONS

Mijin HA [1] , Donghyun KIM [1] and Ji-Hun YOON [1]

1) *Department of Mathematics, Pusan National University, Busan, Republic of Korea*

Corresponding Author : Ji-Hun YOON, yssci99@pusan.ac.kr

ABSTRACT

Timer options are financial instruments that enable investors to exercise their rights on a random determined maturity date, based on the level of variance budget. These options provide a stable investment opportunity for investors in the unpredictable and complex financial markets, such as global financial crises and COVID-19, which can induce drastic changes of the volatility in the underlying asset. On the other hands, in the stable financial markets, investors who have invested in standard timer options may face the drawback of exercising their options later compared to vanilla options. In this regard, to overcome such disadvantages, we propose timer volatility-barrier options, which are activated when the level of volatility reaches a predetermined downstream barrier level. In this paper, we derive an analytical formula for these contracts and verify the pricing accuracy of timer volatility-barrier options by comparing our solution with those from Monte Carlo simulations. Finally, we conduct numerical studies on timer volatility-barrier options to examine pricing sensitivities with respect to the various model parameters.

REFERENCES

1. C. Bernard, Z. Cui, Pricing timer options, J. Comput. Finance 15(1) (2011) 69-104.
2. J.-P. Fouque, G. Papanicolaou, K.R. Sircar, Asymptotics of a two-scale stochastic volatility model, Equ. Deriv. Partielles Appl. (1998) 517-525.
3. J.-P. Fouque, G. Papanicolaou, R. Sircar, K. Sølna, Multiscale stochastic volatility for equity, interest rate, and credit derivatives, Cambridge University Press, Cambridge, 2011.
4. D. Kim, J.-H. Yoon, C.-R. Park, Pricing external barrier options under a stochastic volatility model, J. Comput. Appl. Math. 394 (2021) 113555.
5. C. Li, Bessel processes, stochastic volatility, and timer options, Math. Finance 26(1) (2016) 122-148.
6. A.J. Neuberger, Volatility Trading, IFA Work. Pap. 140(91) 1990
7. D. Saunders, Pricing timer options under fast mean-reverting stochastic volatility, Can. Appl. Math. Q. 17(4) (2010) 737-753.
8. N. Sawyer, SG CIB launches timer options, Risk 20(7) (2007) 6.