

The valuation of catastrophe equity puts in GARCH model with stochastic intensity of global warming

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Abstract

A catastrophe equity put (CatEPut) contract provides protection for the shareholders of the underlying insurance company to hedge catastrophic and equity losses. There are three factors to produce the large variation of the insurer's equity, including the volatility of the insurer's equity except the catastrophe risks, the jump frequency and the jump sizes of the insurer's equity in the catastrophe risks. In this paper, we incorporate GARCH model with the stochastic intensity of global warming and generalized loss distribution to develop a risk-neutral GARCH with stochastic intensity and generalized jump size model (GARCH-Jump) by the Esscher transform. The model not only describes the more characteristics of nature catastrophe and stock market but also involves the more factors for evaluation. Then, the CatEPut option is computed by Monte Carlo simulation. Numerical results indicate that (1) arrival intensity, jump size for catastrophe and (2) volatility, asymmetric effect, ARCH effect, GARCH effect for underlying stock price are the important factors for evaluation of CatEPut.

Keywords: catastrophe equity put, catastrophe risk, GARCH-Jump model, Esscher transform