

Assessing Quantile Reserves of Long-Duration Equity-Linked Insurance Products for Returns Exhibiting Stochastic Volatility

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Abstract

This paper proposes a stochastic volatility (SV) model that allows its latent volatility component to be long- or short- memory for valuing equity-linked insurance products. The phenomenon of long-memory stochastic volatility (LMSV) exists according to daily S&P500 index data from January 1977 to December 2006. Based on this evidence, we study the effect of LMSV on assessing the quantile reserves (Value at Risk, VaR) for equity-linked life insurance analytically. The confidence intervals for quantile reserves of a specific type of guaranteed minimum maturity benefits (GMMBs) are derived when the volatility of returns is long- or short-memory. Simulation studies examine the accuracy of the confidence intervals and demonstrate the consequence of low coverage probability if misspecification takes place. Applying the formulae for confidence intervals to both the 25-year and 30-year GMMBs products linked to S&P 500 index shows that the confidence intervals of quantile reserves could be severely underestimated if the long-memory effect in asset volatility is ignored.