Stochastic annuities: an exploration of Black-Scholes model from an actuarial perspective

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ABSTRACT

The fundamental insight of the celebrated Black-Scholes option pricing model is that in the absence of arbitrage opportunities financial derivatives are implicitly priced in a complete financial market. As far as an actuary is concerned, annuity is undoubtedly one of the most commonly seen financial arrangement in the insurance sector. Hence a natural question arises - how does one determine the price of an annuity under which interest rates are credited in accordance with the investment returns from a financial market as described in the Black-Scholes model?

This talk presents a variety of stochastic annuities which are derived from the annuities-certain well studied in the theory of interest. When the investment returns from stock markets are shared with annuity holders, the price of annuities can be determined by a replicating portfolio of risky and risk-free assets in a similar fashion as options are determined in the Black-Scholes model. We shall also demonstrate many other fascinating aspects of stochastic annuities in comparison with traditional annuities-certain.