

# Equity linked insurance products: Introduction and valuation

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## **Brief Description**

Nowadays, many insurance companies and financial institutions are involved in trading variable annuity and equity-indexed insurance contracts. The contractual structures of these products are more sophisticated than traditional insurance products. In particular, these products contain various exotic derivatives features. So, advanced quantitative tools and methods are required for the valuation of these products. In this talk, I shall first provide a brief introduction to the equity linked insurance products and market. Then a new valuation method will be proposed, and simple closed-form valuation formulas will be presented. This talk is based on a joint paper with Hans U. Gerber and Elias S.W. Shiu.

## Synopsis

Motivated by the Guaranteed Minimum Death Benefits in various deferred annuities, we investigate the calculation of the expected discounted value of a payment at the time of death. The payment depends on the price of a stock at that time and possibly also on the history of the stock price. If the payment turns out to be the payoff of an option, we call the contract for the payment a (life) contingent option. Because each time-until-death distribution can be approximated by a combination of exponential distributions, the analysis is made for the case where the time until death is exponentially distributed, i.e., under the assumption of a constant force of mortality. The time-until-death random variable is assumed to be independent of the stock price process which is a geometric Brownian motion.

A substantial series of closed-form formulas is obtained, for the contingent call and put options, for lookback options, for barrier options.

Whereas in the most important applications the stopping time is the time of death, it could be different in other applications, for example, the time of the next catastrophe. This is a joint paper with Hans U. Gerber and Elias S.W. Shiu.