

Scenario-based Valuation in Participating Life Insurance and Unit-link Insurance

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March 26, 2015

Abstract

Using a two-account model with event risk, we model life insurance contracts taking into account both guaranteed and non-guaranteed payments in participating life insurance as well as in unit-link insurance. Here, event risk is used as a generic term for life insurance events such as death, disability, etc. In our treatment of participating life insurance, we have special focus on the bonus schemes “consolidation” and “additional benefits”, and one goal is to formalize how these work and interact. Along with this, we describe similarities and differences between participation life insurance and unit-link insurance. By use of a two-account model, we are able to illustrate general concepts without making the model too abstract. To allow for complicated financial markets without dramatically increasing the mathematical complexity, we focus on economic scenarios as for example worst-case or best-estimate scenarios, stress scenarios from Solvency II, or scenarios generated via Monte-Carlo simulation. This allows for easy computations in any financial market for a given scenario. In addition, our model offers a common framework for valuation of life insurance payments across product types. This enables comparison of participating life insurance products and unit-link insurance products, thus building bridge between the two different ways of formalizing life insurance products. Finally, our model distinguishes itself from the existing literature by taking into account the Markov model for the state of the policyholder and, hereby, facilitating event risk.

Keywords: two-account model; economic scenarios; participating life insurance; unit-link insurance; stochastic differential equations; guarantees; bonus; fairness; market valuation.

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