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A Finite Difference Approach to the Valuation of Path Dependent Life Insurance Liabilities

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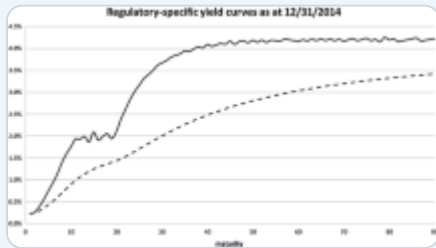
Abstract

This paper sets up a model for the valuation of traditional participating life insurance policies. These claims are characterized by their explicit interest rate guarantees and by various embedded option elements, such as bonus and surrender options. Owing to the structure of these contracts, the theory of contingent claims pricing is a particularly well-suited framework for the analysis of their valuation.

The eventual benefits (or *pay-offs*) from the contracts considered crucially depend on the history of returns on the insurance company's assets during the contract period. This path-dependence prohibits the derivation of closed-form valuation formulas but we demonstrate that the dimensionality of the problem can be reduced to allow for the development and implementation of a finite difference algorithm for fast and accurate numerical evaluation of the contracts. We also demonstrate how the fundamental financial model can be extended to allow for mortality risk and we provide a wide range of numerical pricing results.

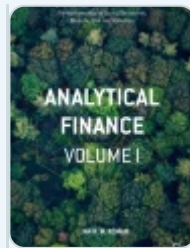
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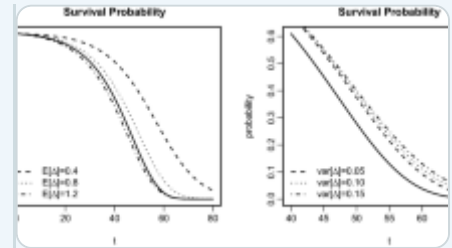
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