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

[Original Paper](#) | Published: 01 June 2001[Volume 26, pages 57–84, \(2001\)](#) [Cite this article](#)[Download PDF](#) 

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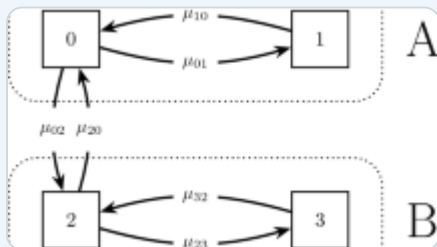
This paper sets up a model for the valuation of traditional participating life insurance policies. These claims are characterized by their explicit interest rate guarantees and by various embedded option elements, such as bonus and surrender options. Owing to the structure of these contracts, the theory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

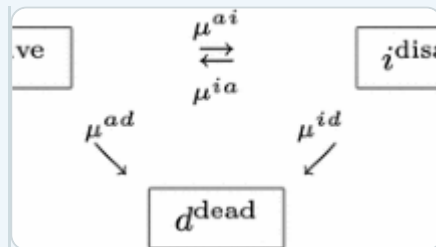
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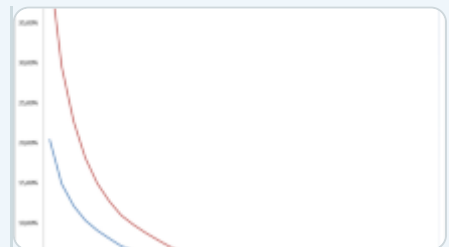
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Cite this article

Jensen, B., Jørgensen, P. & Grosen, A. A Finite Difference Approach to the Valuation of Path Dependent Life Insurance Liabilities. *Geneva Risk Insur Rev* **26**, 57–84 (2001).

<https://doi.org/10.1023/A:1011264408187>

Received

07 July 2000

Issue Date

01 June 2001

DOI

<https://doi.org/10.1023/A:1011264408187>

Revised

27 March 2001

Published

01 June 2001

Keywords

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[embedded options](#)

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