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APPLIED SECTION

Lapse rate modeling: a rational expectation approach

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Abstract

The surrender option embedded in many life insurance products is a clause that allows policyholders to terminate the contract early. Pricing techniques based on the American Contingent Claim (ACC) theory are often used, though the actual policyholders' behavior is far from optimal. Inspired by many prepayment models for mortgage backed securities, this paper builds a Rational Expectation (RE) model describing the policyholders' behavior in lapsing the contract. A market model with stochastic interest rates is considered, and the pricing is carried out through numerical approximation of the corresponding two-space-dimensional parabolic partial differential equation. Extensive numerical experiments show the differences in terms of pricing and interest rate elasticity between the ACC and RE approaches as well as the sensitivity of the contract price with respect to changes in the policyholders' behavior.

Keywords:

Surrender option | Prepayment models | Splitting methods

JEL Classification Codes:

G21 | G22

Notes

1. We need to further assume some smoothness and integrability conditions.

2. Specifying the condition at r=0 is a delicate issue. Zvan et al. (1998) let the partial differential equation be satisfied at that boundary. Barone-Adesi et al. (2003) use a Neumann boundary condition. Having experimented both alternatives, we align with Zvan et al. (1998)'s choice which seems to be more robust.

3. A better solution would be to let θ^{I} depend on some economic indicators giving information about the financial difficulties of the policyholders such as the unemployment rate, rather than keeping it constant (see Kuo et al. 2003, Kim 2005). However, the introduction of such variables considerably affects the simplicity of the model, since a new source of risk that cannot be hedged away should be taken into account.

Related Research Data

An Empirical Study on the Lapse Rate: The Cointegration Approach
Source: Journal of Risk & Insurance
Endogenous model of surrender conditions in equity-linked life insurance
Source: Insurance Mathematics and Economics
On the Risk of Insurance Liabilities: Debunking Some Common Pitfalls
Source: Journal of Risk & Insurance
Modeling Surrender and Lapse Rates With Economic Variables
Source: North American Actuarial Journal
On accounting standards and fair valuation of life insurance and pension liabilities
Source: Scandinavian Actuarial Journal

Danish Mutual Fund Performance - Selectivity, Market Timing and Persistence
Source: SSRN Electronic Journal
Interest Rate Risk Management and Valuation of the Surrender Option in Life Insurance Policies
Source: Journal of Risk & Insurance
Fair valuation of life insurance liabilities: The impact of interest rate guarantees, surrender options, and bonus policies
Source: Insurance Mathematics and Economics
THE VALUATION OF AMERICAN PUT OPTIONS
Source: The Journal of Finance
Analyzing Convertible Bonds
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How Well Do Financial and Macroeconomic Variables Predict Stock Returns: Time-Series and Cross-Sectional Evidence
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Finite Difference Methods in Financial Engineering
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Fair Valuation of a Guaranteed Life Insurance Participating Contract Embedding a Surrender Option
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Source: Journal of Computational and Applied Mathematics
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Source: European Financial Management

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