

MODELLING THE SURRENDER CONDITIONS IN EQUITY-LINKED LIFE INSURANCE

Anna Rita Bacinello

*Dipartimento di Matematica Applicata alle Scienze Economiche
Statistiche ed Attuariali “B. de Finetti”, Università di Trieste*

E-mail: bacinel@units.it

ABSTRACT

In this paper we propose a model for pricing a unit-linked life insurance endowment policy embedding a surrender option. We consider both single-premium and annual-premium payments. In a first moment we analyse a quite general contract, without specifying the way in which benefits and surrender values are linked to the reference portfolio. For this general contract we obtain a backward recursive valuation formula based on the Cox, Ross and Rubinstein (1979) *binomial* model. Then we concentrate upon a particular case of the general contract, that is the celebrated model with *exogenous* minimum guarantees pioneered by Brennan and Schwartz (1976) and Boyle and Schwartz (1977). In this particular case we extend our analysis in order to take into account the possibility that the minimum guarantees at death or maturity and the cash surrender values are *endogenously* determined, and provide necessary and sufficient conditions for the premiums to be *well defined*. The discussion of some numerical results accompanies our analysis.

Keywords: surrender option, equity-linked life insurance, exogenous and endogenous guarantees, single and annual premium contracts, binomial trees.

References

- Boyle, P.P. and E.S. Schwartz (1977): “Equilibrium Prices of Guarantees under Equity-Linked Contracts”, *The Journal of Risk and Insurance* 44(4): 639-660.
- Brennan, M.J. and E.S. Schwartz (1976): “The Pricing of Equity-Linked Life Insurance Policies with an Asset Value Guarantee”, *Journal of Financial Economics* 3: 195-213.
- Cox, J.C., Ross, S.A. and M. Rubinstein (1979): “Option Pricing: A Simplified Approach”, *Journal of Financial Economics* 7: 229-63.