A hybrid variable annuity contract embedded with living and death benefit riders

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Abstract

This paper considers a hybrid variable annuity (VA) contract embedded with guaranteed minimum accumulation benefit (GMAB) and guaranteed minimum death benefit (GMDB) riders where the policyholder has the option to surrender anytime prior to maturity. The contract promises the return of the premium paid by the policyholder, or a higher rolled-up value, at the end of the investment period or upon policyholder's death. The product design is structured around a two-account setting where management fees and related costs associated with being invested in the underlying mutual fund are deducted from the investment account. Guarantee fees for financing the GMAB and GMDB riders are deducted from a separate cash account both of which are owned by the policyholder from inception of the contract. This setting general enough to accommodate various fee structures proposed in literature and reflects typical product features for some VA contracts traded in Australia, rather than a single investment account setting often specified in existing literature. We have incorporated stochastic mortality in the valuation framework by adopting the Renshaw and Haberman model [3] calibrated to the Australian mortality data from the Human Mortality Database to facilitate numerical illustrations. Our setting naturally leads to a unique valuation framework which we tackle utilising the method of lines algorithm [1, 2]. We analyse the interplay of management and guarantee fees under the two-account setting and how they influence policyholder surrender behaviour. Retirement income securities are tax free beyond preservation age of 60 in Australia, as such, we analyse policyholder behavior prior and past this preservation age.

References

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