

Risk-minimization with mortality derivatives: mixed dynamic and static hedging

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Abstract. We derive risk-minimizing hedging strategies for a life insurance company whose liabilities are described by a general insurance payment process. For life insurance companies with long term liabilities, it is essential to use bonds and interest rate derivatives in order to hedge the interest rate risk associated with these liabilities. In addition to traditional financial assets such as the savings account, bonds and stocks, which may be traded dynamically in continuous time, the financial market is assumed to exist of a mortality derivative, which may be traded at fixed, discrete times only. Within this setting of mixed dynamic and static hedging, we adopt the criterion of risk-minimization by requiring that the risk process is minimized at the fixed trading times for the mortality derivative only. The optimal mixed dynamic and static risk-minimizing strategies are compared with the optimal dynamic strategies, and certain correction terms that arise, when trading is restricted to discrete time for the mortality derivative, are identified. We provide numerical illustrations with survivor swaps and compare the minimum obtainable risk with the risk for the optimal dynamic strategies.

Key words: Life insurance, risk management, stochastic mortality, longevity, mortality derivative, survivor swap, hedging, risk-minimization.

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