

Economic Pricing of Mortality-Linked Securities: A Tâtonnement Approach

Rui Zhou, Johnny Siu-Hang Li*and Ken Seng Tan

Abstract

In previous research on pricing mortality-linked securities, the no-arbitrage approach is often used. However, this method, which takes market prices as given, is difficult to implement in today's embryonic market where there are few traded securities. In this study, we approach the pricing problem from a different angle by considering methods that are more related to fundamental economic concepts. Specifically, we treat the pricing work as a Walrasian tâtonnement process, in which prices are determined through a gradual calibration of supply and demand. In our proposed framework, we first model stochastic mortality with a calibrated multinomial tree, and then we apply a Markovian decision process to the tree, creating a supply curve for the investor and a demand curve for the hedger. The supply and demand curves provide important insight into the market clearing condition as well as the fair price of the security in question. We present the proposed framework in both single- and multi-period settings, and illustrate it with some hypothetical mortality-linked securities.

Keywords: Longevity risk; Mortality bonds; Stochastic mortality

*Corresponding author. Address: Department of Statistics and Actuarial Science, University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1.