

A Two-Population Mortality Model with Jump Effects

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Mortality dynamics are subject to jumps, which are due to interruptive events such as the Spanish u epidemic in 1918. These jumps have a significant impact on prices of mortality-linked securities, and therefore should be taken into account in modeling. In previous research, a few mortality models with jump effects have been developed. However, as they are designed for modelling a single population only, they are not adequate for situations when population basis risk is involved. In this paper, we fill this gap by incorporating jump effects into a two-population mortality model, which is recently proposed by Cairns et al. (2010). To capture different patterns of jumps, we present two versions of the model. The first version, which assumes that both populations have mortality jumps concurrently, is particularly suitable when one population is a subpopulation of the other. The second version is more general, permitting nonconcurrent mortality jumps. The proposed models are illustrated with different pairs of national populations. Furthermore, through the proposed models and an economic pricing method, we examine how mortality jumps may affect the supply and demand of mortality-linked securities.