Mortality Compression and Longevity Risk

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Abstract

Mortality improvements, especially of the elderly, have been a common phenomenon in many countries since the end of World War II, and many believe life expectancy will continue to increase. As a result, longevity risk becomes an essential component in designing annuity products, as overestimating mortality rates may result in financial insolvency for a life insurance company. Stochastic mortality models have been a popular choice for addressing this risk. However, the longevity predictions of these models are based on historical data and the predictions behave somewhat like extrapolation. But there are no guarantees that future longevity will follow historical trends.

Instead of fitting stochastic models for mortality rates, this study explores increasing life expectancy by examining the basic properties of survival curves. Specifically, we shall check if there are signs of mortality compression (i.e., rectangularization of the survival curve) and evaluate what it means to designing annuity products. Note that the majority of past studies for mortality compression use graduated mortality rates and their results are likely influenced by the graduation methods used. Based on the raw mortality rates, we propose an alternative approach and also propose some measurements to verify if there is mortality compression. We then apply the proposed method to the mortality rates of Japan, Sweden and the United States (data source: Human Mortality Database). Unlike the previous results using the graduated mortality rates, we found there are no obvious signs that mortality improvements are slowing down. This indicates that human longevity is likely to increase, at least for a while, and longevity risk should be seriously considered in pricing annuity products. In addition to verifying the mortality compression, we also propose some suggestions for dealing with the longevity risk.

Key Words: Mortality Improvement; Longevity Risk; Mortality Compression; Graduation, Mortality Models