Optimal Consumption and Annuity Equivalent Wealth with Mortality Model Uncertainty

Aging and Retirement

SUMMARY

The classical Yaari lifecycle model (LCM) lies at the very heart of much modern retirement research, particularly the economic understanding of annuity demand. The LCM predicts a high annuity demand among individuals facing retirement, yet it is rarely the case in reality. Such a disconnect between economic theory and practice is known as the annuity puzzle, spurring intensified research attempting to demystify its economic and psychological underpinnings.

This paper aims to understand the cause of low annuity demand through the angle of mortality model uncertainty. To this end, Yaari's LCM is advanced via incorporating a mortality model uncertainty analysis (a.k.a. perturbation analysis) and obtain the optimal robust consumption policies. Under an uncertain mortality environment, annuity equivalent wealth (AEW) is examined with the resulting observation that investors may understate the value of an annuity if mortality model uncertainty is ignored.

HIGHLIGHTS

- The researchers conducted a perturbation analysis on the classical Yaari lifecycle model to investigate the impact of mortality model uncertainty on the implied annuity equivalent wealth.

- The researchers found that the worst-case mortality scenario in the perturbation analysis corresponded to an improved mortality trajectory. This implies that a retiree's aversion against mortality uncertainty is translated into the fear of longevity risk in retirement planning.

- The worst-case perturbed mortality model is a parallel shift (also known as the proportional hazard distortion) of the best-estimated reference mortality curve.

- Even under the presence of mortality model uncertainty, annuitization can still induce a noticeable increment in the discounted lifetime utility in consumption for a retiree.

- The optimal annuity payout pathway increases over time as the mortality rate grows and as more uncertainty about the future is resolved during the later stage of retirement.

- The presence of mortality ambiguity aversion increases the value of annuity equivalent wealth.

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METHODOLOGY

- The researchers extended the classical Yaari lifecycle model (LCM) by:

  o Integrating with a perturbation analysis to identify the optimal annuity payout pathway that is robust to the uncertainty occurring from the best-estimated mortality model.

  o Generalization of the additive utility considered in Yaari's LCM for capturing retirees' different types of risk preferences.

- The researchers addressed the mortality model uncertainty via

  o Defining a set of alternative models that are statistically similar to the best-estimated model.

  o Identifying the worst-case mortality scenario that leads to the lowest discounted lifetime utility in consumption.

  o Optimizing the annuity payout pathway based on the worst-case mortality.

- The researchers used the annuity equivalent wealth to quantify the utility increment gained by annuitization.

REPORT SPECS

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- Contents: Introduction and Executive Summary, Summary of the approach and findings, A recap of Yaari's lifecycle model (LCM), Formulation of the LCM with mortality model uncertainty, Main results, Conclusions, Acknowledgements, References, Appendix, 5 figures, and 2 tables.
- Data source: Human Mortality Database

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