Longevity Risk and Hedge Effects in Portfolios of Pension Products with Investment Risk

Ralph Stevens[a], Anja De Waegenaere[b], and Bertrand Melenberg[c]

Abstract

Future payments of life insurance products depend on the uncertain evolution of survival probabilities. This uncertainty is referred to as longevity risk. Existing literature shows that the effect of longevity risk on old-age pension liabilities can be substantial, and that there exists a natural hedge potential from combining old-age pension annuities with death benefits or survivor swaps. However, the effect of financial risk and portfolio composition on these hedge effects is typically ignored. The aim of this paper is to quantify the hedge potential of combining different life insurance products and mortality linked assets when an insurer faces both longevity and investment risk. We show that the hedge potential of combining different mortality-linked products depends significantly on both the product mix and the asset mix. First, ignoring the presence of other liabilities, such as partner pension liabilities, can lead to significant overestimation of the hedge effects of death benefits or survivor swaps on longevity risk in old-age pension annuities. Second, investment risk significantly affects the hedge potential in a portfolio of life insurance products. For example, the inclusion of death benefits in a portfolio of life insurance products may even lead to an increase instead of a decrease in risk when investment risk is high. Finally, we show that the hedge potential of survivor swaps that are based on the whole population instead of the population of the insurer, might be very small.

Keywords: Life insurance, life annuities, death benefits, survivor swaps, risk management, financial risk, longevity risk, insolvency risk, capital adequacy.

[a] Department of Econometrics and OR, Tilburg University, CentER for Economic Research and Netspar, PO Box 90153, 5000LE Tilburg, The Netherlands, Phone: +31 13 4662478, Fax: +31 13 4663280, Email: R.S.P.Stevens@uvt.nl.

[b] Corresponding author: Department of Econometrics and OR, Tilburg University, CentER for Economic Research and Netspar, PO Box 90153, 5000LE Tilburg, The Netherlands, Phone: +31 13 4662913, Fax: +31 13 4663280, Email: A.M.B.DeWaegenaere@uvt.nl.

[c] Department of Econometrics and OR, Department of Finance, Tilburg University, CentER for Economic Research and Netspar, PO Box 90153, 5000LE Tilburg, The Netherlands, Phone: +31 13 4662730, Fax: +31 13 4663280, Email: B.Melenberg@uvt.nl.