Hessisches Kompetenzzentrum
für Hochleistungsrechnen

Lifetime Portfolio Choice and Optimal Retirement Decisions

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Project Term
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Software
MATLAB

Institute
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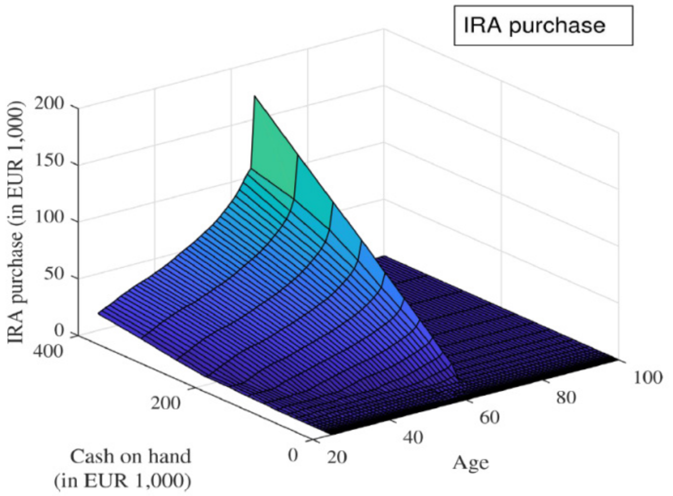

Figure 1: The policy plot for Riester IRA investments on the z-axis displays how much a saver should optimally invest in a Riester IRA given that she has a particular age (x-axis) and level of financial resources (y-axis). Herein it is assumed that the individual has never before made a contribution to the IRA and that she earns the populations' average income.

Introduction

Millions of European and American workers are increasingly asked to accumulate pension assets. In order to augment public pension benefits and move towards a more pre-funded program, many countries have permitted workers to invest some of their payroll tax-free into Individual Retirement Accounts, e.g. the Riester plans in Germanyor the 401(k) plans in the United States. Within this project, we want to study using dynamic portfolio choice models the optimal demand for pension assets over the life cycle where our focus is particularly on the timing to purchase longevity income annuities depending on the uncertain level of interest rate. In addition, we analyse the role of loss aversion and regulatory requirements to accumulate and decumulate assets in individual retirement accounts (such as money-back guarantees, LC-funds, and RMD rules).

Methods

The solution of dynamic portfolio choice models in discrete time comprises the maximization of the individual's utility over her financial decisions given here current state (e.g., wealth, labor income, health, etc.) for every time step. Therefore, the state space of the individual must be discretized by a grid and interpolation is used for points off the grid. In consequence, the problem is embarrassingly parallel and well-suited to be solved with massive parallelization on a high-performance computer.

Results

Subproject 1 (Annuity risk due to stochastic interest rates): The numerical results of our life cycle model show that temporal diversification of annuity risk enhances welfare for retirees up to 9% of certainty equivalent consumption and that welfare gains increase with higher interest rate risk. Subproject 2 (The optimal deferral period for QLAC's deferred longevity income annuities): Based on our recent work on longevity income annuities (Horneff et al. 2020, JBF), we consider a LC model with CRRA preferences, in which the individual can invest in stocks, bonds and 401(k) plans. At the age of 65 the investor may transfer money from his 401(k) account into QLAC deferred annuity. We find that the greatest welfare gain for a woman with a college degree is in the case with QLAC, which only makes a lifelong payment from the age of 79. Subproject 3 (Life-Cycle Portfolio Choice with Stock Market Loss Framing): The preliminary results with only a few parameter combinations show that embedding these behavioral elements in the preference specification of a life-cycle model gives a better match with respect to empirical patterns of asset allocation. Subproject 4 (Money-back guarantees in individual retirement accounts): Our results suggest that during historically "normal" capital market times, abolishing embedded money-back guarantees in IRAs would allow to increase retiree consumption by 1-3% per year, yet coming at the cost of 6.5% of retirees ending up with lower consumption than under the current IRA regime. In a persistent low interest rate environment, the mean consumption improvement from abolishing guarantees is large, amounting to 3-11%, or on average €1,000 per year.

Discussion

- Our results underline the importance of allowing for temporal diversification of annuity risk in case of stochastic interest rates, which contributes significantly to the welfare of the household.
- The deferral age at QLAC differs in the dependency of educational level and gender. Here we need additional calculations to complete and explain the results.
- The results show that partly behavioral preference specification help reconcile life-cycle models' predictions with empirical evidence with respect to asset allocation. Thus, in future extensions one could include additional risks or institutional details into the model.
- Our analyses allow a quantification of the economic consequence of different risk mitigation techniques in individual retirement accounts. In future extensions, we intend to include additional assets (e.g. life annuities).

Publications

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