FINANCIAL PLANNING AND RISK MANAGEMENT FOR RETIREMENT: OPTIMAL INVESTMENT-CONSUMPTION CHOICES UNDER MULTIPLE RISK EXPOSURES

By

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ABSTRACT

With an increase in life expectancy and a shift from defined benefit to defined contribution plans for retirement funding, individuals are exposed to and need to manage more risks on their own. This research addresses optimal consumption and investment selections with consideration for health, financial and longevity risk.

We define a health evolution model for identifying and measuring health risks in retirement planning. We construct a health status index to summarize an individual's health status, as well as a health risk factor system to identify the level of health risk of an individual. Based on maximum likelihood estimate and nonlinear least squares fitting, model calibration is formulated as mixed-integer nonlinear optimization problems. Data from the National Health Interview Survey is used to calibrate the model for specific risk groups. Longitudinal data from the Health and Retirement Study is used to validate the model.

Annuities can be effective tools in managing longevity risk. In order to address this risk management problem, we develop a framework that merges annuity purchase decisions with consumption-investment selections in retirement planning. After introducing a pricing model and a benefit payment model for an annuity, we construct a multi-period wealth evolution model. An optimization problem is formulated with the objective of maximizing lifetime utility of consumptions and wealth. Optimal decisions are determined as a trade off between consumption and investment among an annuity, a risky and a risk-free asset. The health evolution model is used to capture the longevity risk in the framework.

For a more sophisticated study of the management of financial risk, we formulate a wealth risk management framework which provides downside protection and upside potential. From the perspective of individual investors, we identify three major risk dimensions and construct risk measures for each risk dimension. Available assets are classified into the three risk dimensions, protective, market and aspirational, based on their risk-return profiles. All risk dimensions are optimized simultaneously through appropriate allocation of total wealth in the investment as-

sets. We implement the framework in different market scenarios to test it, along with utilizing market data to check its performance in real world.