



Retirement saving with contribution payments and labor income as a benchmark for investments[☆]

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Abstract

In this paper we study the retirement saving problem from the point of view of a plan sponsor, who makes contribution payments for the future retirement of an employee. The plan sponsor considers the employee's labor income as investment-benchmark in order to ensure the continuation of consumption habits after retirement. We demonstrate that the demand for risky assets increases at low wealth levels due to the contribution payments. We quantify the demand for hedging against changes in wage growth and find that it is relatively small. We show that downside-risk measures increase risk-taking at both low and high levels of wealth. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

In this paper we study the problem of saving for retirement with contribution payments and labor income as a benchmark for investments. We consider the retirement saving problem from the point of view of a plan sponsor. The plan sponsor makes contribution payments to an investment fund in order to save for the future retirement of an employee. The goal is to ensure that the employee can continue his consumption pattern after retirement. As the consumption habits of the employee are related to his

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wages, the plan sponsor considers the labor income of the employee as a benchmark for investments.

Clearly, the plan sponsor is not only concerned about the welfare of the employee and also wants to minimize his contribution payments. We formalize this in a multi-period retirement saving model, where the plan sponsor makes a trade-off between the utility of low contribution payments and the utility of high fund values at retirement, relative to the labor income of the employee. The solution of the model reveals the optimal dynamic investment strategy and the optimal funding policy of the plan sponsor.

The retirement saving model presented in this paper includes both a defined contributions pension plan and a ‘final pay’ defined benefits plan as special cases. The generality of the model allows us to circumvent the large difference in pension schemes throughout the world: we focus on the core of the retirement saving problem. Clearly, not every plan sponsor or pension fund considers labor income as a benchmark for investments. However, we believe that it is in the interest of the employees to do so, without any adverse consequences.

An important assumption throughout the paper is that the labor income of the employee cannot be replicated with the available assets: consequently, the financial market is incomplete. Moreover, we assume that the wage growth rate is partly predictable. Given the basic model setup, we derive optimal decision rules by applying dynamic programming. The optimal decision rules specify the asset weights and the contribution payment as a function of the state variables (the wealth-to-income ratio and the wage growth rate) and provide direct insight into the underlying problem.

We are particularly interested in the following issues, which are relevant for retirement saving and have not been studied adequately in the literature yet

1. What is the magnitude of the demand for the hedge portfolio against random changes of the wage growth rate?
2. What is the impact of contribution payments on the optimal asset allocation?
3. What is the optimal multi-period investment strategy for investment objectives based on downside-risk measures, which are very popular in practice?
4. What is the effect of an objective that assigns utility to a high fund value before the retirement date (on top of utility at retirement)?

With our implementation of the dynamic programming algorithm we were able to address these three main questions about optimal investment and funding in the retirement saving model. The conclusions to be drawn from our analysis and computational experiments are as follows:

1. Regardless of his utility function, the plan sponsor invests in a hedge portfolio against random fluctuations of the employee’s labor income. The hedge portfolio depends on the covariance of the asset returns with the wage growth rate. The numerical results demonstrate that the correlation between asset returns and wage growth has a substantial influence on portfolio composition. Dynamic adjustments of the hedging strategy due to changes of the wage growth rate are relatively small.
2. Contribution payments change the optimal investment strategy considerably, even for a plan sponsor with constant relative risk aversion over fund value. The portfolio

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