

Review

Valuation of intergenerational transfers in funded collective pension schemes[☆]

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Abstract

This paper applies contingent claim analysis to value pension contracts for real-life collective pension plans with intergenerational risk sharing and offering DB-like benefits. We rewrite the balance sheet of such a pension fund as an aggregate of embedded generational options. This implies that a pension fund is a zero-sum game in value terms, so any policy change inevitably leads to value transfers between generations. We explore intergenerational value transfers that may arise from a plan redesign or from changes in funding policy and risk sharing rules. We develop a stochastic framework which accounts for time-varying investment opportunities and computes the embedded generational options. Changes in the values of the generational options enable us to evaluate the impact of policy modifications in the pension contract with respect to intergenerational transfers and redistribution. We find that a switch to a less risky asset mix is beneficial to elderly members at the expense of younger members who lose value. A reallocation of risk bearing from a plan with flexible contributions and fixed benefits to a plan with fixed contributions and flexible benefits leads to value redistribution from older plan members to younger ones.

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1. Introduction

The pension fund industry worldwide is in a turbulent period. The combination of falling stock returns and falling interest rates after 2000 caused a major funding crisis for traditional defined benefit plans. On top of that, the introduction of fair value principles in the pension fund industry has had a profound impact. The trend is to define more explicit and transparent pension contracts (Kortleve et al., 2006). In the US and UK private sectors, DB plans have largely been replaced by individual defined contribution (DC) plans (Munnell, 2006). Employer-sponsored DB plans also have been replaced by stand-alone pension funds with DB-like benefits, where risks are shared between the younger and older generations of plan members according to explicit rules (Boeri et al., 2006). Many pension funds in the Netherlands have recently taken this route (Ponds and van Riel, 2007). Also, sectorwide pension funds and public sector pension funds in countries such as Canada, the US and Finland have moved in the direction of stand-alone risk-sharing cooperatives (Ambachtsheer, 2007).

It is well documented that collectively funded pension schemes with intergenerational risk sharing may be welfare enhancing.¹ Current and future plan participants are able to share shocks in asset returns and labour income and thereby smooth these shocks over and even beyond the lifespan of any single generation (Cui et al., 2006; Gollier, 2007; Teulings and de Vries, 2006). Surpluses or deficits in the funding process can be shared between younger and older generations and future generations by adjusting either contributions, benefit levels or a combination of these. Mandatory participation backed by appropriate government legislation makes this long run smoothing possible as future generations cannot opt out when they are confronted with a low initial level of funding. However, Cui et al. (2006) show that even pension funds with deficits in their funding offer welfare improvements for new young entrants.

The move to stand-alone risk-sharing cooperatives has been accompanied by a change in risk bearing in order to

create a more robust solvency position in financial downturns. An example of this type of reform is the compensation of pensions for inflation. Traditional DB plans always offered inflation indexation irrespective of the solvency position of the pension fund. Recently stand-alone risk-sharing plans have reconsidered indexation policy by introducing inflation compensation rules conditional on the financial position of the fund. For risk sharing cooperatives, a crucial question is what the impact is of pension reforms on different groups of participants. It is not hard to imagine that specific policy changes will harm some groups of beneficiaries but will be beneficial to others.

In financial markets, the no-arbitrage principle guarantees that the market-based compensation for risk taken is fair, such that risk-taking is compensated by an appropriate reward. Within pension funds, the rules of the pension contract define the risk and reward allocation among the members. Unlike option holders in the financial markets, it is not guaranteed that the participants in DB schemes are fairly compensated for their risk-taking. Embedded value transfers may occur when the risk bearing parties are not properly compensated. This can endanger the long-term sustainability of pension schemes. In the current ageing society, younger participants demand more transparency in the implicit risks they are exposed to. This paper focuses on the exploration of embedded value transfers induced by changes in the pension deal. The pricing of these embedded transfers should be based on how risks are priced in the market. Similar to financial options we therefore apply contingent claims analysis as a market consistent method to value the embedded options in the pension contract.

The contribution of this paper is to value generational transfers in real-existing collective pension plans. As a first step we identify embedded generational options by rewriting the balance sheet of a pension fund. Changes in the value of generational options enable us to evaluate the impact of policy switches in the pension contract with respect to intergenerational transfers and redistribution. In the second step we use a stochastic valuation framework which also captures time-varying investment opportunities. We explore intergenerational value transfers that may result from a plan redesign or from changes in funding policy and risk sharing rules.

¹ For a general exposition on the welfare aspects of intergenerational risk sharing, see Gordon and Varian (1988) and Shiller (1999). Contributions to the extensive literature in the field of pensions can be divided into the categories of risk sharing via “pay-as-you-go” plans (see Merton (1983), Enders and Lapan (1982) and Krueger and Kubler (2006)) and risk sharing via funded plans (see Cui et al. (2006) and Gollier (2007)).

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