Designing social security – a portfolio choice approach

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Abstract

Public social security systems may provide diversification of risks to individuals' life-time income. Capturing that a pay-as-you-go system (paygo) may be considered as a "quasi-asset", we study the optimal size of the paygo system as well as the optimal split between funded and unfunded pension saving by means of a theoretical portfolio choice framework. A low-yielding paygo system can benefit individuals if it contributes to hedge other risks to their lifetime resources. Numerical calculations indicate that optimal social security systems should be at least partly paygo financed in many economies. The optimal magnitude of the paygo system depends on the specified risk concept as well as the stochastic properties of stock market returns and implicit paygo-returns.

1. Introduction

One of the most important justifications for public social security programs is presumably imperfect insurance markets. What we have in mind is non-marketability of human capital and also potential limitations in many individuals' access to the stock market. This paper analyzes how such imperfections influence the optimal design of

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a social security system. Capturing that a pay-as-you-go (paygo) system may be interpreted as a "quasi-asset" (Merton, 1983; Persson, 2002), we derive the optimal size of the paygo program as well as the optimal split between funded and unfunded pension saving by means of a portfolio choice approach.

The main bulk of the recent large literature on social security reforms takes as its point of departure that aging populations weaken the financial viability of social security systems, which mainly are financed on a paygo basis.[1] It is well known that the implicit return of the paygo system is given by the growth of aggregate wage income, reflecting the combined effect of productivity- and labor supply growth. This implicit return is lower than the real interest rate in a dynamically efficient economy. Deterministic models therefore predict that a funded program is superior to a paygo program in steady-state, reflecting that a paygo program redistributes resources to the initial old generation from all future generations. Not surprisingly, projections of deteriorating dependency ratios have led many economies to attempt to derive a politically feasible and maybe even Pareto-optimal transition from a paygo program to a (partly) funded program.[2]

The conclusion that a funded program is superior to a paygo program in steady state is not always valid, however, when we take into account that returns on both paygo and funded systems are stochastic. In a stochastic framework, a lower expected rate of return on the paygo system does not necessarily imply that it is an inferior alternative. A low-yielding paygo system can benefit individuals if it contributes to hedge other risks to their lifetime resources. This reflects the basic idea that the paygo asset is not spanned by other assets due to an imperfect correlation between stock returns and the growth of aggregate wage income. Thus, the paygo system is a government created asset that allows one generation to trade in the human capital returns of the next.

This paper considers three sources of risk to net individual income: (i) Wage income risk – reflecting technology shocks, (ii) fluctuations in the size of the population, which influence the aggregate labor supply, and (iii) a stochastic return on stock market investments. Employing a simple theoretical overlapping generations model, we characterize the optimal social security system under various assumptions about individuals' participation in the stock market. The paper focuses exclusively on risk sharing issues in an overlapping generations framework with one representative individual within each generation. We disregard intragenerational redistribution and assume that labor supply is exogenous.[3] It turns out that our analysis is sensitive to the definition of the relevant

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[1] See for example, Feldstein (1996), Kotlikoff (1996) and Fehr (2000).

[2] A Pareto optimal transition from a paygo program to a funded program is only possible if the "reform-package" also lowers the excess burdens of the tax-transfer program, see Homburg (1990), Sinn (2000) and Miles (2000).

[3] The labor supply effects of a social security reform hinge essentially on the impact on the tax-benefit link. Many papers on social security reforms seem to assume that the tax-benefit link is very weak in a paygo system and fully actuarial (at least marginally) in a funded system. It is quite possible, however, to imagine a tax-benefit link which is close to actuarial in a paygo system and rather weak in a system which is funded in an aggregate sense, see Miles (2000) and Thøgersen (2001). Thus, even if we recognize that labor supply responses to social security reforms are very important, we will argue that it is beneficial to separate the analysis of this issue from the risk sharing aspects of different social security systems.