The Effective Rate of Return for Defined Contribution Pension Systems in a Stochastic Framework

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The aim of this work is to extend the logical sustainability model for the defined contribution pension systems from the deterministic (see [1], [2]) to the stochastic framework. In particular, with reference to our previous papers developed in this field, we considered defined contribution pension systems either in a steady state of general stability (see [3], [4]) or in a stable state temporarily disrupted by a demographic and/or economic wave (see [5]). Our main results in terms of pension system sustainability are founded on a basic rule for the stabilization over time $t$ of the level of the unfunded pension liability with respect to wages, defined as the $\beta(t)$ indicator. In this paper, we focus on this rule under assumptions that the financial rate and the growth rate of productivity are both modelled by stochastic processes whereas the demographic structure is stable. In the numerical simulations, regarding the two variables modelled by stochastic processes, we use the long term average values similar to the deterministic values assumed in the three scenarios (base, pessimistic, and optimistic) in the Orange Reports for the Swedish Pension System for the “real return on the buffer fund” and the “real growth in earnings”, respectively. Under these assumptions, we show that the rule for the $\beta(t)$ stabilization keeps on its validity in order to the sustainability also in the stochastic framework. In addition, we show that the choice of the rate of return on the pension liability based on this rule is also effective, in the meaning that if we use a rate systematically higher or lower than that provided by the rule, then the pension system becomes respectively not sustainable or recapitalises, and hence these choices are not effective.

Keywords: defined contribution pension system, logical sustainability, stochastic financial rate, stochastic productivity rate

References


