

THE PROBABILISTIC APPROACH TO THE PUBLIC PENSION SYSTEM

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ABSTRACT

In this paper we consider two topics related to the Public Pension System (PPS). First, we propose an analytic method on the stochastic projection for the future pension fund amount. To achieve this, we step from the simple one period case under the discrete time, in which we apply the central limit theorem (CLT) for the analytic stochastic projection. For the multi period one, we move to the continuous time model. For this we introduce the stochastic differential dynamics. In the simulation approach the baseline result of the deterministic method is used as the mean value. In our method, we utilize the various sensitivity result as well as the baseline one from the deterministic projection. In particular, we perceive the actual projection range with the highest and lowest cost results among the sensitivity outputs. From these range we obtain the volatility of our stochastic dynamic following Parkinson. In this reason it is naturally to maintain the consistency with the deterministic projection result, which is very important since it is still main result in the financial valuation of the PPS.

Second, we introduce the reserve ratio and explore the limiting behavior of this ratio. From this, we derive a relationship between the premium and benefit levels focussing on the financial sustainability. In addition, we can also have two significant consequences. One is the minimum reserve ratio, which has the meaning like the solvency ratio in an insurance company. The other is the intuitive interpretation for the liability volume of the PPS, which is a controversial issue so-called the unfunded liability. Through these probabilistic approaches we expect to support more reasonable and meaningful information essential to administration of the PPS.

Key words: Public Pension System, stochastic projection, Premium and Benefit Levels, reserve ratio