Cash-flow based valuation of pension liabilities

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In the absence of liquid markets for insurance obligations their pricing should be based on the cash flows associated with the settlement of the obligations until maturity. When valuing long terms pension liabilities, significant risks are associated both with the claims as well as with investment returns that affect the sufficiency of the capital reserved for covering the claims. According to modern risk management principles the value of insurance liabilities should reflect both the underwriting risks as well as market risks until the amortization of the liabilities; see e.g. [1].

In an uncertain world, pension insurance liabilities cannot be fully hedged or full hedging may amount to unreasonable costs. More practical approach is to define the value of pension liabilities as the minimal capital required to cover the claims at an acceptable level of risk. Such a value depends essentially on the following subjective factors

1. **market expectations:** view about the future development of market returns and the insurance claims, both of which involve significant uncertainty that should be appropriately quantified.
2. **risk preferences:** the level of risk at which the investment returns should cover the insurance claims. Instead of simple confidence levels, one could use risk measures that better support risk management.
3. **investment strategy:** the strategy according to which the required initial capital is invested in the financial markets. Appropriate matching of the investment strategy to the liabilities may result in a reduction in the required amount of initial capital.

The significance of market expectations is usually well understood but the effect of risks is often ignored or it is accounted for by heuristic adjustments (see e.g. the drafts of Solvency II framework). When valuing risky cash flows the effects of (more or less subjective) risk tolerances cannot be avoided. Some studies have suggested the use of so called “risk neutral measures” but also they correspond to a specification of risk preferences. The investment strategy defines the competence of an insurer in delivering the cash flows associated with its insurance portfolio.

The paper develops a computational framework for valuing pension liabilities in an uncertain environment taking into account the risk preferences of the underwriter. Encouraging numerical results from the Finnish pension industry are presented.

References

[1] International Association of Insurance Supervisors. The IAIS common structure for the assessment of insurer solvency. Technical report, 2007.