Pension Options Valuation and Hedging Bounds

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Contingent claims model have been proposed as a more appropriate approach to value underfunded pension liabilities than the actuarial present value model, as the model reduces the opportunities to manipulate the pension liabilities. In this paper, many contingent claims models (CCA) are used to provided analytical solutions valuing defined pension liabilities: i) use standard Black-Scholes(1973) option model to price liabilities with nominal values and derive a tighter pricing and hedging bounds; ii) use Margrabe(1978) exchange options model to price liabilities with varied values and validate the results using Monte Carlo simulation model; iii) use Stulz (1982) rainbow option model to price pension scheme integrated with sponsor companies.

There is a growing literature about CCA (Contingent Claims Analysis) – a technique that defines and analyses all claims on the company in terms of options. From a CCA viewpoint, the pension claims maybe regarded as a form of corporate debt for the sponsor companies. The market value of this security can be approximated as a put option. Existing option valuation models are used to provide numerical insight into the significance of various factors for the value of pension liabilities. The main factors influencing the value of pension liabilities ate the volatility of the company's and pension fund's assets, the correlation between pension assets and liabilities, the relationship between corporate debt and equity, the average duration of liabilities, and current funding ratio. One of major advantages of these models is risk free rate, key parameter required in actuarial present value model, can be eliminated in valuation process. The paper presents a unified framework for a market related arbitrage-free valuation of pension liabilities, which paves road to pension liabilities securitisation.