

Economic valuation of defined benefit pension liabilities

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The pensions industry operates largely by pricing annuities and other pension products with the actuarial discounting principle which can be traced back to at least the 19th century. This is in sharp contrast with financial economics and the banking industry where valuations are based on the costs of producing a product's payouts in the face of uncertainties and incompleteness of financial markets. The deficiencies of the classical actuarial methods are widely recognized by the industry but the transformation of the practices has been slow due to the challenges of applying economic valuation principles in pensions. Typical pension liabilities extend over several decades and their payouts depend on longevity developments which are uncertain and largely independent of the investment returns that insurers earn on their funds in financial markets.

We present mathematical models and computational techniques for asset-liability management and valuation of defined benefit liabilities. The valuations look for the cheapest hedging strategy that covers the pension payments until maturity with an acceptable level of risk. Under complete markets assumption, this coincides with the classical replication argument while in the deterministic case, we recover the actuarial "best estimate". The approach is illustrated by the valuation of the insurance portfolio of the Finnish private sector pension system.