

# How should pensions liabilities be valued? Risk aversion and demographic uncertainty.

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Organisers: Prof JL Hutton and Prof SD Jacka,  
Department of Statistics, University of Warwick

## **How can people share their longevity risks?**

*Dr Catherine Donnelly, Heriot-Watt University*

Modern tontines enable the pooling of longevity risks among a group of people. They offer retirees the chance for a life-long, reasonable income by making cost-efficient use of pension savings. While this can also be done in a life annuity, the annuitant is generally forced to buy the guarantees implicit in a life annuity contract. In contrast, tontines can be structured with and without guarantees. We show one method for structuring modern tontines.

This talk is based on joint work with Thomas Bernhardt, Montserrat Guillen, Jens Perch Nielsen and John Young.

## **Mortality Estimation and Forecasting: Models, Methods and Issues**

*Professor Jon Forster, University of Southampton*

The Royal Society has a long association with mortality estimation dating back to the original development of the subject by John Graunt, presented to the Society in the seventeenth century. Mortality forecasting, an essential component in the valuation of pension liabilities, has a much more recent heritage. Modern forecasting methods are typically based on stochastic models and allow realistic quantification of uncertainty and, where appropriate, the incorporation of expert opinion. This talk will present a selective review of model-based mortality forecasting approaches. Key issues in mortality forecasting will be considered, including cohort variation, smoothing, sparse data and the potential for borrowing strength by jointly modelling (sub)populations. In light of recent UK data exhibiting relatively weak mortality improvements, the question of how reactive forecasts should be to apparent shifts in observed mortality experience will also be discussed.

## **Intergenerational fairness: Statistics, assumptions & actuarial models**

*Professor Jane Hutton, University of Warwick*

Inter-generational fairness is an important and ancient concept in society and government. With respect to pensions, inter-generational fairness as well as fairness to women of a certain age have been debated when considering changes in state pension age.

Funded defined benefit schemes which are estimated to have deficits are required to impose deficit recovery payments or change benefits. Current members pay not only for their own future pensions, but also for their predecessors' (and their own) accrued entitlements. It is often assumed that this means younger people paying for older people. However, older generations' pensions contributions have provided productive capital investment and infrastructure used by all ages. Strict inter-generational

'fairness' within a scheme might neglect wider social balance.

Actuarial models require assumptions in order to estimate assets, liabilities, life expectancy and other demographic factors. Multiple assumptions biased away from statistically valid estimates can substantially increase an estimated deficit. Consequences of these assumptions affect not only the particular scheme's stakeholders, but wider society. Money used for deficit recovery payments is diverted away from business investment and dividends. A large estimated deficit can bankrupt a company, and put many people out of work. If pension contributions are tax-exempt, the government's income is reduced.

Assumptions underlying actuarial models are not merely economic or statistical.

## **Monetary Risk and Prudence**

*Professor Saul Jacka, University of Warwick*

Prudence is the first of the cardinal virtues of Plato (and then of Aquinas) and much misunderstood in modern times. It has come to mean something akin to "caution" or even "pusillanimity" whereas its original meaning is closer to "wisdom". In the context of action, we will argue that the original meaning is closer to what is required in the context of pension valuation. In particular, that valuation must have regard to facts and experience. In this talk I will attempt to rehearse the sources of the "modern" prudential approach to pension fund valuation and explain why they are inadequate and often overly-pessimistic. In 1999, Artzner, Delbaen, Eber and Heath introduced the concept of a Coherent Risk Measure (CRM), in part to address problems with the popular measure of monetary risk-Value at Risk. CRMs are characterised by the three properties: cash-invariance, subadditivity, positive homogeneity/scaling. These are properties that any (prudent) valuation method has. Any CRM can be represented by probabilistic scenario analysis i.e. as the worst calculated mean under a range of probabilistic scenarios. The fundamental flaw with such measures is that they usually fail to be temporally consistent. I will give some discussions in terms of coherent (monetary) measures of risk and explain in principle how to address and how not to address the failure of time-consistency in these measures.

## **Actuarial valuation and risk management under P and Q**

*Alexander McNeil, University of York*

The value of complex insurance and pension liabilities, and of the assets that back them, depends on a number of risk factors, which may be financial, demographic and behavioural. Modern approaches to point-in-time valuation and to projection of surpluses and deficits typically blend market-consistent techniques (under the risk-neutral measure Q) with real-world statistical considerations (under the physical measure P). The subtle interplay of these measures make valuation and projection conceptually and practically challenging tasks.

This talk will present an overarching framework for these issues and consider the role and state-of-the-art of computational solutions, such as proxy models, least-squares Monte Carlo simulations and recent ideas from artificial intelligence.

## **The macro-economic context for pensions: monetary policy and financial stability**

*David Miles, CBE, Professor of Financial Economics, Imperial College*

Low yields on government bonds particularly on indexed bonds mean that estimates of pension deficits that depend on bond prices have been driven up. Are such low yields likely to persist and

does it make sense to evaluate the sustainability and the risks that Defined Benefit pension schemes run by reference to them? This talk will consider these issues and reflect on how concerns on financial and fiscal stability mean that the legitimate concerns of regulators will be particularly relevant.

### **Inflation Guarantees in Pensions: Valuation and Hedging.**

*Andrew Smith, UCD*

Most UK defined benefit schemes provide retirement benefits linked to inflation, with the link subject to maximum or minimum levels of increase. It may be required to report fair valuations of these liabilities allowing for the embedded inflation options. Investments (in conventional and index-linked bonds) may be informed by a sensitivity analysis, re-expressing liability cash flows into equivalent real and nominal components.

The results of these calculations depend on many things: inflation assumptions, volatility assumptions, the valuation model used, sensitivity definitions especially near fixing dates, demographic assumptions, use of model points and other simplifying demographic assumptions.

An IFoA working party results will be discussed in this session:

- Alternative modelling approaches.
- The difference in reported values and sensitivities, with explanations for these.
- Example spreadsheets implementing various models.
- Draft guidance for standardising definitions to improve consistency within the industry.

### **The Affordability of the UK State Pension**

*Paul Sweeting, Chief Risk Officer, Hassana Investment Company*

For some years the affordability of the UK State Pension has been an issue. And for some years, the most visible answer to this issue has been to raise the State Pension Age. However, increasing the State Pension Age has a much greater impact on the least well-off - and they are the ones who are most dependent on this benefit. Just as importantly, increasing the State Pension Age is unlikely to control the cost of State Pensions in the long run.

Paul Sweeting investigates the concept of means-testing instead of using the State Pension Age alone to control costs. Means testing for the State Pension would not be unprecedented. In fact, when the Old Age Pension was introduced in 1909, it was brought in as a means-tested benefit. Furthermore, it is already used in Australia for state pension benefits there. Paul Sweeting demonstrates that using means-testing, whether alone or in conjunction with increases to the State Pension Age, could help to control the cost of the UK State Pension. He also argues that it could do so equitably, ensuring that those who most need this benefit it are more likely to receive it.

### **Optimal design: From insurance policy to economic policy**

*Professor Mogens Steffensen, University of Copenhagen, Denmark*

Abstract: We discuss how utility optimization can help to shape improved product design, that appropriately unveils and takes into account the demand for life insurance among young individuals and the demand for annuities among old individuals. Classes of objectives lead to classes of optimal life-cycle profiles of consumption, investment, insurance and annuitization decisions that can help pension funds to better target the needs of an individual, both in the savings and the payout phase. To some extent these profiles can also help politicians make an improved design of the pension system as such. We discuss some of the homogeneous issues and dilemmas that turn up in pension policy making in different countries with various heterogeneous pension systems. Can utility optimization really help,

not only in insurance policy making but also in economic policy making?

### **Pension fund governance and trustee investment decision-making**

*Dr. Anna Tilba, Durham University*

This study examines how UK pension fund trustees interpret the concept of their fiduciary duties in practice and how these interpretations may shape pension fund approaches to corporate stewardship and engagement as envisioned by the UK Stewardship Code. Using the data from 35 in-depth, semi-structured interviews with pension fund trustees, executives, investment intermediaries and a series of round-table discussions with pensions experts, the study uncovers interpretive pluralism of the concept of Fiduciary Duty in the area of pension funds. A model identifying the spectrum of pension fund engagement is developed, showing how different interpretations of fiduciary duty may be linked to various intensity and methods of engagement in practice. The findings help disambiguate the concept of fiduciary duty, highlighting the challenges of Stewardship Code application in practice. These insights are very relevant to the ongoing revisions of the Stewardship Code and further policy clarifications of the nature of fiduciary duty by the UK Financial Conduct Authority. This paper encourages trustees, regulators and others to consider closely what role pension fund trustees should have in stewardship, which may not be directly relevant to their fiduciary duties as trustees.

### **The UK State Pension age review and demographic uncertainty**

*Colin Wilson, Deputy Government Actuary, Government Actuary's Department*

The 2017 review of State Pension age included an independent report (the "Cridland report") and projections of life expectancy by the Government Actuary. A particular feature of the latter was an indication of alternative scenarios reflecting some of the uncertainty in future longevity. Since these reports an apparent slowdown in longevity improvements seems to have crystallised, highlighting the importance of acknowledging the degree of uncertainty inherent in longevity projections. This session explains how the review allowed for uncertainty and some possible implications.