

Developments in Pension Design and Investment Modelling

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BOOK OF ABSTRACTS

(names in alphabetic order)

Renata G. Alcoforado

Socioeconomic Benefits of the AtestMed Programme in the Brazilian Welfare & Pension System

This study analyses forecast modeling with time series for INSS expenses related to the AtestMed programme within the Brazilian Welfare and Pension System. The AtestMed programme, a recent socioeconomic initiative by the Brazilian government, aims to manage benefit compensations due to temporary disability more efficiently. It is designed to ameliorate and shorten delays in the processing and payment of compensations, resulting in significant savings by reducing disability periods. The dataset used includes monthly monetary data from 2021 to 2023, adjusted for inflation according to the National Consumer Price Index (INPC, Índice Nacional de Preços ao Consumidor). Our model incorporates variables such as Mean Cost Delay, Cost Delay, and Mean Value of Initial Salary Payment, all related to the Social Security Temporary Disability Benefit. We examine the behavior of INSS costs with and without the AtestMed programme, noting that AtestMed was implemented in July 2023. The methodology employs six different time series models (Simple, Holt and Holt-Winters Exponential Smoothing, ARMA, ARIMA, and SARIMA) for the Mean Delay Cost variable. By comparing the outcomes for total costs with and without AtestMed, this approach provides a deeper understanding of temporal and seasonal trends in INSS spending, anticipates variations, and optimizes socioeconomic management. The forecasts generated from this study aim to enhance strategic decision-making within the scope of social security. Joint work with Hudo L. S. G. Alcoforado, Pedro A. Tenório, Alfredo D. Egídio dos Reis, Alessandro A. Stefanutto and André P. F. Fidelis.

Jennifer Alonso-Garcia

Intergenerational risk sharing in pay-as-you-go pension schemes

We present a two-step convex family of risk-sharing mechanisms. The first shares the risk between contributors and retirees through adjustments in the contribution rate, used to calculate the global covered wage bill, and the benefit ratio that represents the relationship between average pensions and wages. The second step studies how the retirees' risk should be shared between the different retirees' generations through adjustments in the replacement rate and a sustainability factor that affects pension indexation during retirement. We perform a detailed study of the effect of social planner's targets and solidarity weight between various generations in a deterministic and stochastic environment. Joint work with H. Morsomme and P. Devolder.

Carol Bernard

Tontines as a Tool for Wealth Management

A one-period tontine is a collective investment fund in which every participant enters with an initial contribution, but only those participants who are still alive at maturity are entitled to receive a share of the total fund value. A vast literature proposes various sharing rules using as a main criterion the actuarial fairness of the payout, i.e., the sharing is done in such a manner that participants have the same (unconditional) expected return. We revisit this point and suggest alternative sharing rules that aim at being better suited to investors. Specifically, we discuss how to share mortality risk using as a fairness criterion equality in expected utility among participants. A main finding is that in a competitive market only (asymptotically) actuarially fair tontines are viable. Furthermore, when entering into a tontine, the value of the tontine for the participant highly depends on its composition. However, participants typically subscribe to the scheme without any knowledge of either the composition of the tontine, or even its exact payout scheme. We propose a smart contract that offers full disclosure of information in a tontine and discuss the practical implementation of such a tontine and some new risks that it could face. This talk is based on joint papers with Mohammad Abou Daya (Grenoble Ecole de Management), Marco Feliciangeli (Vrije Universiteit Brussel) and Steven Vanduffel (Vrije Universiteit Brussel).

Evmorfia Blontzou

Forward Utility Process for Collective Pension Funds

We propose an alternative model for a pension fund's investment policy that produces time-consistent portfolio strategies. Unlike the optimization problem faced by an individual member, a pension fund does not have a fixed terminal (retirement) time because new members continuously join and existing members retire over time. Consequently, setting an optimization goal for a specific future time can result in time-inconsistent investment strategies after any given time horizon. To address this challenge, we introduce a forward continuous-time model in which the investment criteria are defined by an adapted process that behaves as a supermartingale for any admissible strategy and becomes a true martingale under the optimal strategy. This model allows the pension fund manager to dynamically adjust risk aversion, beliefs, and the investment environment. We derive the necessary conditions for characterizing the solution through random partial differential equations and investigate whether well-known initial utility functions, such as the exponential utility, can provide explicit expressions for the optimal portfolio. This is a joint work with M. Anthropolos and T. Zariphopoulou.

Ales Cercy

Explicit Formula for Near-Optimal Stochastic Lifestyling

In life-cycle economics, the Samuelson (1969) paradigm states that the optimal investment is in constant proportions out of lifetime wealth composed of current savings and the present value of future income. It is well known that in the presence of credit constraints this paradigm no longer applies. Instead, optimal lifecycle investment gives rise to so-called stochastic lifestyling (Cairns et al., 2006), whereby for low levels of accumulated capital it is optimal to invest fully in stocks and then gradually switch to safer assets as the level of savings increases. In stochastic lifestyling not only does the ratio between risky and safe assets change but also the mix of risky assets varies

over time. While the existing literature relies on complex numerical algorithms to quantify optimal lifestyling, the talk provides a simple formula that captures the main essence of the lifestyling effect with remarkable accuracy. Joint work with Igor Melicherik (Comenius University Bratislava).

Ioannis Chatzivasiloglou

Regulatory Asset Modeling in Insurance

Models are simplified representations of a given phenomenon. As such, their development and structure is based on certain assumptions. Asset models, i.e. models that are used either for the current pricing of assets or for their projection in the future, are based predominately on two fundamental assumptions related to the degree of the perceived information (in)efficiency of financial markets and to the expectations for the future behavior and sentiments of the market participants. The presentation elaborates on asset models that are used in insurance for regulatory purposes i.e. valuation of insurance liabilities, calculation of capital requirement and illustration / comparability of future account values and pension benefits and it outlines their fundamental assumptions.

Griselda Deelstra

Optimal Life Annuitisation and Investment Strategy in a Stochastic Mortality and Financial Framework

This paper tackles the problem of retired individuals' choices regarding the allocation of their wealth between classical financial investments and life annuities during their post-retirement phase in order to maximize their future utility. We consider a stochastic framework in which equity, interest rates, and mortality risks are taken into account as well as possible dependencies among the considered risk factors. Because of the complexity of the model, we rely on simulation and regression techniques to solve the dynamic portfolio optimization problem. In particular, we exploit the well-known Least-Squares Monte Carlo methodology. This is joint work with P. Devolder and F. Viviano.

Runhuan Feng

Decentralized Annuity: A Quest for the Holy Grail of Eternal Financial Security

There have been a wide variety of longevity risk sharing plans proposed in the recent literature, including tontines, group self-annuitization, annuity overlay funds, etc. In contrast with traditional (centralized) annuities, they can all be viewed as special cases of decentralized annuity, where all longevity risks are borne by participants as opposed to being transferred to a third party such as an insurer. This paper offers a general framework in which various notions of fairness and individual rationality properties are discussed and compared. New designs are proposed to meet desirable properties and to address issues with other known plans.

Constantinos Kardaras

Portfolio Choice under Taxation and Expected Market Time Constraint

We consider the problem of choosing an investment strategy that will maximise utility over distributions, under capital gains tax and constraints on the expected liquidation date. We show that the problem can be decomposed in two separate ones. The first involves choosing an optimal target distribution, while the second involves optimally realising this distribution via an investment strategy and stopping time. The latter step may be regarded as a variant of the Skorokhod embedding problem. A solution is given very precisely in terms of the first time that the wealth of the growth optimal portfolio, properly taxed, crosses a moving stochastic (depending on its minimum-to-date) level. The suggested solution has the additional optimality property of stochastically minimising maximal losses over the investment period.

Arun Muralidhar

SeLFIES/Ασφαλής: A Simple Innovation to Help Greece Achieve Multiple Goals

A commonly-accepted retirement goal for a healthy pension is for it to sustain the relatively higher standard-of-living of the latter part of one's working life throughout retirement. A recent innovation implemented by Brazil in January 2023 might provide a solution to the pension challenges faced by Belgium, and more importantly, satisfy the key goals identified by Greek Government. We recommend Greece create and issue an innovative new bond –ASFALIs (Annuity-like Securities for inflation-Adjusted Life-time Income), known previously as SeLFIES. This ASFALIs bond is a single, simple, liquid, low-cost, relatively low-risk (government-issued) instrument, easy-to-understand for even the most financially unsophisticated individual, because it matches the desired real retirement income profile of individuals and embeds accumulation, decumulation, compounding and inflation-adjustments. Brazil launched RendA+, through Treasury with a simple two-question app and digitalization has led to financial inclusion and potentially improving gender equality. It can be purchased/sold in slices as small as €5/time. This instrument is a win-win-win for the government, citizens and the financial services industry, and could have substantial pan-European demand.

Georgios Pitselis

Some New Developments in Mortality Modelling

Although the Gompertz law had a key role in predicting mortality over a century, and the pioneer method of Lee and Carter (1992) and its extensions in forecasting mortality, these methods do not capture the determinants (characteristics) of the individuals. Our work goes beyond the Gompertz law, the Lee-Carter method and its extensions, focusing on genetic and environmental factors that can have an influence on longevity. More specifically, we introduce two exponential regression-type methods for modelling mortality data based on some population characteristics (factors), including lifestyle, nutrition, education, environment, race, gender, etc. Joint work with Apostolos Bozikas (University of Piraeus).

Constantinos Stefanakis

Numéraire Portfolio with Small Liability Stream

We consider a continuous-time, infinite horizon market that is driven by a factor process. In this context we study the second order approximation of the log-optimal wealth process under an exogenous non-replicable endowment. We show that this approximation can be characterized by means of a quadratic hedge, under an appropriately chosen numeraire. More precisely we focus on concrete settings with polynomial structure, with regards to the exogenous stream as well as the factor process. Joint work with M. Anthropelos and C. Kardaras.

George Simeonidis

Acknowledging the Importance of the Implicit Pension Debt in European Public Pension Systems

Implicit pension debt, often overlooked, is increasingly recognized as a crucial factor influencing a country's financial health, alongside the more visible national debt. A comprehensive evaluation of a country's fiscal outlook should consider both, acknowledging their unique characteristics. The EU Ageing Working Group's (AWG) reports, published every three years, provide valuable data for estimating outstanding implicit pension debt. This can be done for all EU member states. This presentation provides data from the previous report (2021) to analyze the evolution of pension debt and its relationship with external debt. We conclude that generating comparable estimates of implicit pension debt become a key component of EU policy discussions, fostering greater transparency and informed decision-making.