

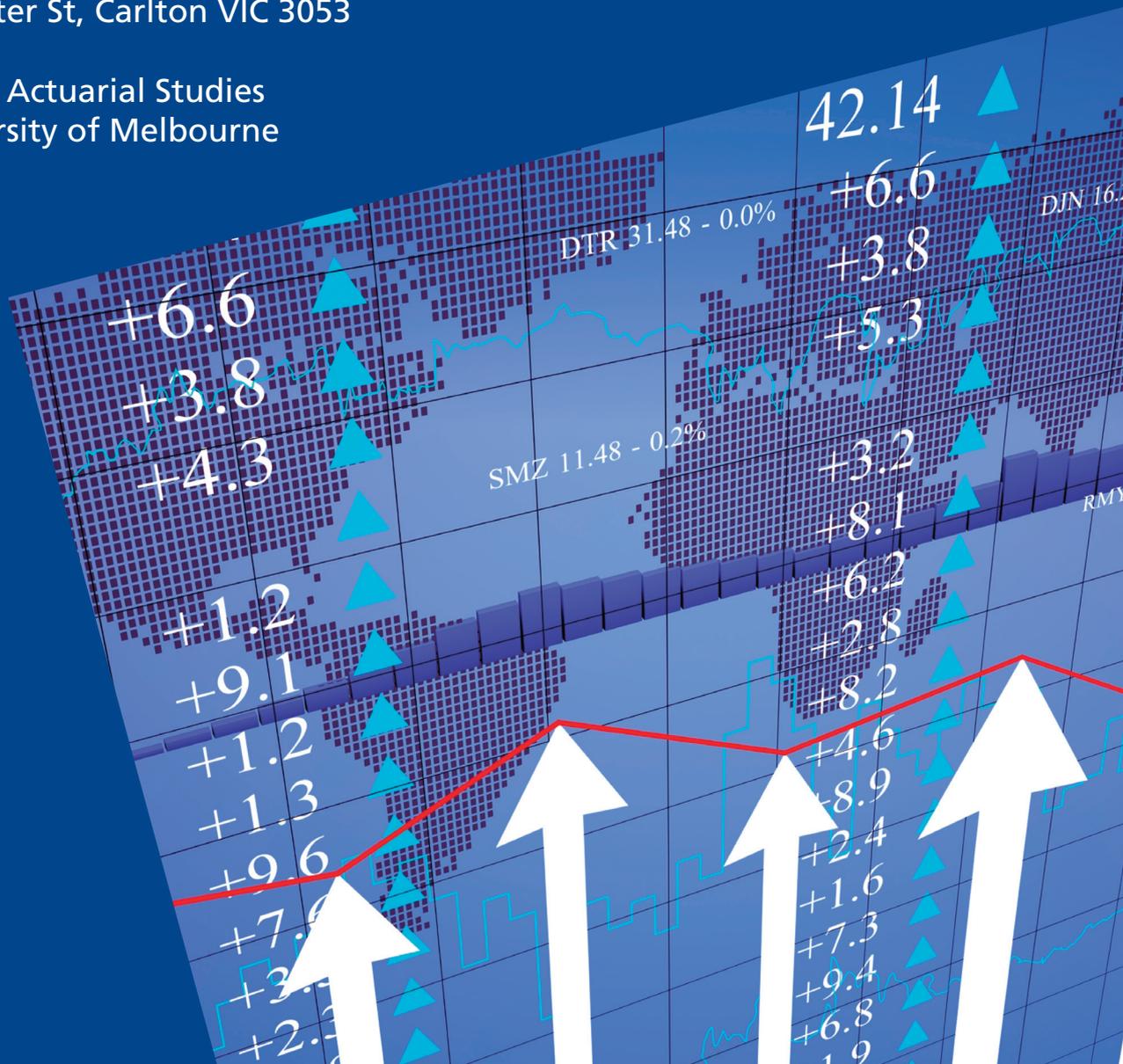


THE UNIVERSITY OF
MELBOURNE

10th Australasian Actuarial Education and Research Symposium

28-29 November 2019
Melbourne Business School
200 Leicester St, Carlton VIC 3053

Centre for Actuarial Studies
The University of Melbourne



Message from the Conference Chairs

On behalf of the Organizing Committee, we are honoured and delighted to welcome you to the 10th Australasian Actuarial Education and Research Symposium (AAERS).

The AAERS is an annual international actuarial conference, where researchers, industry practitioners and graduate students from different parts of the world meet and discuss future directions of actuarial research and teaching.

The theme for this year's AAERS is "Actuarial Knowledge: From Theory to Practice." Through the Symposium, it is our vision to recognise the significance of both theoretical actuarial research that has fundamental importance and practical actuarial research that has an immediate impact on the insurance industry, and to foster interactions between developments of theory and practice. In addition to sessions where academics, students and practitioners can present their research on different fields of actuarial science, a panel session on actuarial education with invited participants will be held during the symposium.

This year's AAERS features prominent invited speakers, including Peter Ayton from the City University of London, Mary Hardy from the University of Waterloo, Yue Kuen Kwok from the Hong Kong University of Science and Technology, and Greg Taylor from the University of New South Wales. Its parallel sessions cover various timely topics on actuarial education and research, encompassing data analytics, climate change, and longevity risk.

We hope that you will find the Symposium both enjoyable and valuable, and also enjoy the cultural and natural beauty of Melbourne.

— Johnny Li and Shuanming Li, Conference Chairs

Organizing Committee

Johnny Li (Co-chair)
Shuanming Li (Co-chair)
David Dickson
Enrique Calderin
Ping Chen
Kevin Fergusson
Zhou Jin
Shane Wu
Rui Zhou

Sponsor



Institute
and Faculty
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Programme

DAY ONE

8:30 – 9:00 **Registration**

9:00 – 9:15 **Opening Remarks – Lecture Theatre 1**

9:15 – 10:00 **Plenary Session 1 – Lecture Theatre 1**
The global pension crisis – A view from academia
Mary Hardy, University of Waterloo

10:00 – 10:30 **Coffee break**

10:30 – 11:15 **Plenary Session 2 – Lecture Theatre 1**
Pricing and hedging variable annuities products: Guaranteed Lifelong Withdrawal Benefits
Yue Kuen Kwok, Hong Kong University of Science and Technology

11:15 – 12:15 **Parallel Session 1**

Longevity Risk

Lecture Theatre 1

Longevity risk: Retirement product innovation and risk management strategies

Doreen Kabuche

Financial engineering: A new longevity bond to manage individual longevity risk

Yuxin Zhou

An experimental study of the demand for bundled longevity and health insurance products
Katja Hanewald

Optimal Dividends

Cohen Theatre

Optimal hybrid dividends under transaction costs

Hayden Lau

Singular dividend optimization for a linear diffusion model with time-inconsistent preferences

Jinxia Zhu

An optimal investment and debt ratio problem with dividend payments in the frameworks of complete information and partial information

Yang Feng

Risk Models I

Rio Tinto Theatre

When (not) to use abstract dependence structures: theoretical and practical considerations

Benjamin Avanzi

On the double counting problem of Bonus-Malus system

Jae Youn Ahn

Discrete time risk models with premiums adjusted according to reported claims

Dhiti Osatakul

12:15 – 1:45 **Lunch**

Programme

DAY ONE

1:45– 2:15	Plenary Session 3 – Lecture Theatre 1 Introduction to the Actuarial Research Centre Johnny Li, Actuarial Research Centre, Institute and Faculty of Actuaries		
2:15 – 3:00	Plenary Session 4 – Lecture Theatre 1 Undesirable psychological influences on human responses to risk and investment decision making Peter Ayton, City, University of London		
3:00 – 3:30	Coffee Break		
3:30 – 4:30	Parallel Session 2		
	Mortality Modelling Lecture Theatre 1 A data analytics paradigm for the construction, selection, and evaluation of mortality Models Andrés Villegas On generalised age period cohort models Timothy Gummer Volterra mortality models Ling Wang	Asset Allocation Cohen Theatre Optimal liability for time-consistent mean-variance asset-liability management portfolio selection problem Jiannan Zhang Analytic valuation of GMDB options with utility based asset allocation Eric Ulm Asset allocation, consumption, and life insurance purchase with stochastic income in a self-contagious market Guo Liu	Risk Models II Rio Tinto Theatre Understanding count processes through a Markov-modulated non-homogeneous Poisson process framework Alan Xian The central limit theorem can fail severely for pairwise independent random variables with arbitrary margins Guillaume Boglioni Beaulieu
4:30– 5:30	Parallel Session 3		
	Pension Lecture Theatre 1 Optimal control of pension funds under the benchmark approach Kevin Fergusson What is the optimal superannuation guarantee level for Australian retirees? Yifu Tang Influences on employer contributions to defined benefit pension plans in the US Tanjila Tabassum	Risk Management Cohen Theatre Impact of shocks on insurance through a financial network Zhiwei Tong Nested stochastic modeling for risk management Thi Minh Hang Nguyen Model risk for pricing guaranteed lifetime withdrawal benefits Xiao Xu	Health Insurance Rio Tinto Theatre Long term care financing using home equity release: Evidence from an experimental study Tin Long Ho On the Type I multivariate zero-truncated hurdle model with applications in health insurance Pengcheng Zhang
6:30 – 9:00	Dinner (reception begins at 6:30pm) – Junior common room, Queen’s college		

DAY TWO

9:00 – 9:45 **Plenary Session 5 – Lecture Theatre 1**

Loss reserving prediction error with special reference to the Tweedie family
Greg Taylor, University of New South Wales

9:45 – 10:45 **Parallel Session 4****Finance and Insurance**

Lecture Theatre 1

A stochastic differential game for insurance market with Competitive premium
Yang Shen

The rise of peer-to-peer insurance and its mathematical modeling
Runhuan Feng

Generic improvements to least square Monte Carlo methods for optimal stopping
Dan Zhu

Actuarial Education I

Cohen Theatre

A call for actuarial education and research in climate change and sustainability
Giovani Gracianti

Inculcating students with data analysis techniques within university actuarial subjects
Kevin Fergusson

Curtin University's practice-based approach to teaching Actuarial Science
Mark Hayes

10:45– 11:15 **Coffee Break****11:15 – 12:15** **Parallel Session 5****Forecasting and Computing**

Lecture Theatre 1

Coherent mortality modeling for China's provinces in a Bayesian framework
Qian Lu

Multi-population mortality forecasting using tensor decomposition
Yumo Dong

The J programming language and financial & actuarial computing (Notation as a tool of thought – Kenneth E. Iverson)
William Szuch

Actuarial Education II

Cohen Theatre

Increasing collaboration between educators, researchers and industry
Mike Callan and Georgina Hemmings

Theory informing – practice transforming
Andrew Matthews

Greed is not good for business: a mind-map
Anthony Asher

12:15 – 1:45 **Lunch****1:45 – 2:15** **Actuaries Institute Presentation – Lecture Theatre 1**

A collaborative approach to building the Data Analytics Principles syllabus
Amanda Aitken, Michael Callan, and Bernard Wong

2:15 – 3:00 **Education Panel Discussion – Lecture Theatre 1**

Adam Butt, Michael Callan, Mingyuan Guan, and Angela Paladino

3:00 **End of Symposium**

Plenary Presentations

The global pension crisis – A view from academia

ABSTRACT: The global pension crisis has been fuelled by aging populations, persistent low interest rates, declining workplace pensions, declining job security, financial instability of social security systems, and systematic underfunding of employer sponsored pension plans. The pension crisis impacts all three of the traditional pillars of retirement income – government benefits, workplace benefits and personal savings.

In this talk we will review the role of academic research in addressing aspects of the pension crisis involving employer sponsored superannuation schemes and drawdown strategies for optimizing individual welfare for DC funds and individual savings.



SPEAKER: Mary Hardy, University of Waterloo

Mary Hardy is a Professor of Actuarial Science at the University of Waterloo. Her research covers applied risk management in life insurance and pensions. Her early work with Phelim Boyle on modelling and risk management for equity-linked life insurance led to a better understanding of the underlying risks, and significantly enhanced capital requirements in North America in the early 2000s. Her current research focus is on the analysis of risk and risk management for hybrid pension designs, including DB underpin/Floor Offset and Cash Balance plans.

Dr Hardy has co-authored around 50 papers and two (and three-quarters) books on topics in actuarial risk management. She is a past Editor-in-Chief of the North American Actuarial Journal and of the Annals of Actuarial Science. She has served as a Director and as a Vice President of the Society of Actuaries. In 2012, Dr Hardy was awarded the Finlaison Medal of the UK Institute and Faculty of Actuaries for services to the actuarial profession in the areas of governance, teaching, research, and the application of research to practice.

Pricing and hedging variable annuities products: Guaranteed Lifelong Withdrawal Benefits

ABSTRACT: Variable annuities are long-term unit-linked insurance products that offer various types of guarantees. The variable annuities with Guaranteed Lifelong Withdrawal Benefit (GLWB) were introduced with the unique features that combine the longevity protection of an income benefit and periodic withdrawal benefits. In a typical contractual design of GLWB, the policyholder first accumulates assets during the accumulation phase and later receives annuities payments during the income phase. Since the embedded guarantees may be too costly to the issuers and they are difficult to be hedged, many insurers of variable annuities faced record levels of breakage of their risk hedging strategies. The types of risks faced by insurers in the actual implementation of hedging strategies include policyholder behavior, basis risk and execution risk from poor liquidity of hedging instruments. In this talk, we present the construction of pricing models that examine the impact on the variable annuities values under various withdrawal behaviors of the policyholders. Also, we consider the risk management and hedging of variable annuities with GLWB.



SPEAKER: Yue Kuen Kwok, Hong Kong University of Science and Technology

Yue Kuen Kwok is a Professor in the Department of Mathematics, the Hong Kong University of Science and Technology (HKUST). He is the founding director of MSc degree in Financial Mathematics and the director of BSc degree in Mathematics and Economics at HKUST. Professor Kwok's research interests concentrate on pricing and risk management of financial derivatives and structured insurance products. He has published more than 100 research articles in major research journals in quantitative finance and actuarial sciences. In addition, he is the author of two books on quantitative finance: "Mathematical Models of Financial Derivatives", second edition, (2008), and "Saddlepoint

Approximation Methods in Financial Engineering" (2018), both published by Springer. He has provided consulting services to a number of financial institutions on various aspects of structured products trading and credit risk management. He has served in the editorial boards of Journal of Economic and Dynamics Control, Asian-Pacific Financial Markets and International Journal of Financial Engineering. He received his PhD degree in Applied Mathematics from Brown University in 1985.

Introduction to the Actuarial Research Centre

ABSTRACT: In this presentation, the speaker will introduce the Actuarial Research Centre (ARC) of the Institute and Faculty of Actuaries. An overview of the ARC's current and ongoing research programmes will be presented. The speaker will also discuss how academics across the world may get involved in the ARC.



SPEAKER: Johnny Li, Actuarial Research Centre, Institute and Faculty of Actuaries

Johnny Li is Professor of Actuarial Studies at The University of Melbourne. He is a Co-Editor of the North American Actuarial Journal and was a member of the Board of Directors of the Asia-Pacific Risk and Insurance Association. His research has earned several awards, including an Annual Prize from the North American Actuarial Journal, the Harold D. Skipper Best Paper Award from the Asia-Pacific Risk and Insurance Association, and the Redington Prize and the Edward A. Lew Award from the Society of Actuaries. Recently, he has joined Eckler Canada as an advisor on the company's predictive modelling work. He has also worked collaboratively with the Society of Actuaries and the

Institute and Faculty of Actuaries on various research projects. He became an Associate Director of the Actuarial Research Centre (ARC) of the Institute and Faculty of Actuaries in September 2018.

Undesirable psychological influences on human responses to risk and investment decision making

ABSTRACT: I will present a set of empirical studies that show evidence of deleterious psychological influences on human attempts to judgementally navigate risks. These studies indicate that judgemental management of risk is a hazardous activity in itself and raises questions about the competence and validity of professional decisions under risk. While a well-established program of behavioural finance research has shown psychological biases in individual investors, its extension into institutional investors is under-explored. A series of experimental studies investigating pension trustees' investment decision making shows evidence that trustees' decisions are unduly influenced by irrelevant information. These studies show effects incompatible with the strictly rational perspective on human decisions assumed by classical economic theory.



SPEAKER: Peter Ayton, City, University of London

Peter Ayton is professor of Psychology at City, University of London where he has been since 1992. He has held visiting appointments at Carnegie-Mellon University; University of California, Los Angeles, INSEAD; Princeton University; University of Mannheim and the Max Planck Institute for Human Development, Berlin. His research is concerned with the experimental investigation of human judgement – especially risk perception and decision-making under uncertainty. His publications frequently address applied issues including the impact of computerised advice on radiologists' cancer screening decisions; magistrates' bail decision-making; effect of personality and emotion on stock traders' decisions, optimistic bias in convicted prisoners, procrastination in anaesthetists' decision-making and the misconceptions of professional footballers. He has also published papers investigating cognitive illusions such as the sunk cost fallacy, the gambler's fallacy, the hot hand fallacy and overconfidence. His books include "Judgmental Forecasting" (1987); "Subjective Probability" (1994) and "Myths and Facts about Football" (2008).

Loss reserving prediction error with special reference to the Tweedie family

ABSTRACT: The Tweedie family of distributions is well known within loss reserving. A sub-family is examined in which the mean-variance ratio is constant over cells of a claim triangle. Empirical evidence in favour of this sub-family is presented. Parameter estimation for this family presents some interesting challenges. Loss reserving prediction error is also discussed, with special emphasis on its components. All of these components are found to have a specific simple property when the claim observations are drawn from the above Tweedie sub-family. The model error component of prediction error is one on which the literature has comparatively little to offer, but it is considered here in some detail.



SPEAKER: Greg Taylor, University of New South Wales

Greg Taylor is Adjunct Professor in the School of Risk and Actuarial Studies at the University of New South Wales, a position he has held since 2005. He is also a member of the Advisory Board of the Gradient Institute, a not-for-profit organization dedicated to facilitation of the ethical use of algorithms.

He worked as an actuary in industry over the 44 years 1962-1968 and 1977-2013, and spent the intervening period 1969-1976 as an academic. Of the 44 years in industry, 35 were spent as a consulting actuary, mainly concerned with general insurance.

He no longer seeks remunerated work, but is called upon to carry out the occasional assignment.



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