



THE UNIVERSITY OF  
MELBOURNE

FACULTY OF  
BUSINESS &  
ECONOMICS



# Centre for Actuarial Studies

ANNUAL REPORT 2012

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# The Year in Review

## INTRODUCTION

The Centre for Actuarial Studies is part of the Department of Economics. The main activities of the Centre are teaching, research and knowledge transfer. The majority of undergraduate and master students study to become actuaries, but a fraction of them find employment in banking or investments; in particular, a good number of our PhD students have topics in financial mathematics. The Centre is proud of the high achieving students it attracts and strives to give them the best preparation for actuarial and other quantitative work. Because it is fully accredited by the Actuaries Institute, the Centre for Actuarial Studies allows its students to obtain exemptions from the whole of Parts I and II of the actuarial examinations. With regard to research, the members of the Centre are experts in their fields and are internationally recognised for their work in actuarial science, financial mathematics, probability and statistics. The Centre has eight full-time academic staff and several part-time lecturers from the actuarial profession (the complete list is at the end of this report).

The Centre for Actuarial Studies continues to be the focal point for actuarial education in Victoria. It has the support of the actuarial profession in Australia and produces research of high quality. It also maintains strong international links and contributes to the local actuarial community.

## STAFF NEWS

Professor Daniel Dufresne was the Director of the Centre for 2012. Professor David Dickson served as Head of the Department of Economics for the second half of the year.

## RESEARCH AND GRANTS

Staff continued to publish in top journals and to present their research at seminars and conferences. Details of publications and additions to the Centre's Research Paper Series can be found later in this report.

The 4th International Gerber-Shiu Workshop was hosted by the Centre on 4-5 July 2012. The theme of the workshop was risk theory, with particular emphasis on ruin theory and related problems. The keynote speakers were Professor Sheldon Lin (University of Toronto), Professor Hanspeter Schmidli (University of Cologne), Professor Elias Shiu (University of Iowa) and Professor Gordon Willmot (University of Waterloo). The Centre for Actuarial Studies would like to thank the members of the organizing committee (Prof. David Dickson, Dr. Ping Chen, Assoc. Prof. Shuanming Li, Dr. Xueyuan Wu) and Mrs Brooke Hall, for making this event a success.

Professor Daniel Dufresne continued his Linkage Grant for a project "Understanding Cycles in Mineral Commodity Prices, a Market Model with Uncertainty".

Dr. Zhuo Jin was awarded a University of Melbourne Early Career Research Grant for a project entitled "Optimal Dividend Strategy with Capital Injections". He was also awarded a Faculty of Business and Economics Research Grant for a project entitled "A Numerical Analysis of Optimal Dividend Payment and Investment Strategies of Markov-Switching Jump Diffusion Model".

## TEACHING

Overall undergraduate enrolments decreased slightly in 2012 from their 2011 level. Student numbers in 3rd and 4th year were lower, but 45 students completed the Honours year. Overall Master enrollments in 2012 increased from their 2011 level. Details of enrolments are given later in this report.

Teaching was supported by a number of external lecturers including Mr Richard Fitzherbert (Financial Mathematics I and II, APC III), Dr Jules Gribble, Mr David Heath, Mr Cary Helenius, and Mr Donald Campbell (Actuarial Practice and Control I and II).

Actuarial Practice and Control Cycle III (ACTL 40009) was taught for the first time in 2011 as part of Part II exemption. In 2012, this subject saw an increase in the number of students enrolled.

## KNOWLEDGE TRANSFER

Professor Mark Joshi worked on various open source software projects. In particular, he continued to develop and administer the project Kooderive for pricing derivative securities using graphics cards with the CUDA programming language. He also participated in the testing and release of version 5.0 of the popular xlw application for interfacing C++ and EXCEL.

## PROFESSIONAL ACTIVITIES

Professor David Dickson was an external examiner and an independent examiner for the UK actuarial profession at Nanyang Business School, Singapore.

## VISITORS

Professor Felisa Vázquez-Abad, from City University of New York (CUNY), visited the Centre in January and February. Associate Professor Yi Lu, from Simon Fraser University, visited the Centre in February and March. Professor George Yin, from Wayne State University, visited the centre for 2 weeks in May. Professors Mary Hardy (University of Waterloo) and Phelim Boyle (Wilfrid Laurier University) as well as Dr. Jinxia Zhu (University of New South Wales) visited the Centre in December. These visits were mostly for research collaboration with members of the Centre.

# The Year in Review

## MASTER OF ACTUARIAL SCIENCE

The Master of Actuarial Science degree commenced in 2011. This two-year Master program consists of 16 subjects (8 core plus 8 elective subjects) and aims to provide initial actuarial education for graduates who have mathematical or statistical specialisations (e.g. in mathematics, physics, or engineering). The course enables students who obtain a sufficiently high pass to receive exemptions from the professional actuarial examinations conducted by the Actuaries Institute and the Institute and Faculty of Actuaries (UK).

The program director is Professor David Dickson. Further information about this degree is available online at <http://www.gsbe.unimelb.edu.au/programs/actuarial-studies/Master-of-actuarial-science.html>

The joint Master's program in actuarial science with Nankai University started in 2012, with 12 students coming from Nankai to Melbourne.

## TEACHING

### Master of Actuarial Science Class Sizes

Subject Name	2011	2012
ACTL90001 Mathematics of Finance I	4	18
ACTL90002 Mathematics of Finance II	3	16
ACTL90003 Mathematics of Finance III	4	14
ACTL90004 Insurance Risk Models	Not offered	15
ACTL 90005 Life contingencies	Not offered	15
ACTL90006 Life Insurance Models 1	4	14
ACTL90007 Life Insurance Models 2	4	14
ACTL 90008 Statistical Techniques in Insurance	Not offered	15
ACTL90009 Actuarial Practice and Control III	Not offered	2
ACTL90010 Actuarial Practice and Control I	Not offered	1
<b>Total Enrolments</b>	<b>19</b>	<b>124</b>



# Teaching

## Undergraduate & Honours Teaching

Subject Name	2010	2011	2012
ACTL10001 Introduction to Actuarial Studies	178	174	169
ACTL20001 Financial Mathematics I	158	126	124
ACTL20002 Financial Mathematics II	130	115	108
ACTL30001 Actuarial Modelling I	99	112	95
ACTL30002 Actuarial Modelling II	102	112	94
ACTL30003 Contingencies	93	107	85
ACTL30004 Actuarial Statistics	92	102	84
ACTL30005 Models for Insurance and Finance	87	109	79
ACTL30006 Financial Mathematics III	93	107	87
ACTL40001 Actuarial Studies Research Essay	7	5	7
ACTL40002 Risk Theory I	55	50	45
ACTL40003 Risk Theory II	29	21	23
ACTL40004 Advanced Financial Mathematics I	51	50	45
ACTL40005 Actuarial Studies Projects	45	47	39
ACTL40006 Actuarial Practice and Control I	54	50	45
ACTL40007 Actuarial Practice and Control II	41	34	70
ACTL40008 Advanced Financial Mathematics II	11	10	7
ACTL40009 Actuarial Practice and Control III	Not offered	37	43
<b>TOTAL ENROLMENTS</b>	<b>1325</b>	<b>1368</b>	<b>1219</b>

### Honours Grades over the Last Five Years

	H1	H2A	H2B	H3	Total
2008	13	16	11	6	46
2009	15	7	13	2	37
2010	17	14	15	6	52
2011	18	14	13	8	53
2012	12	12	15	6	45

### Honours Results and Theses Topics

The following students successfully completed a Bachelor of Commerce (Honours) with a specialisation in Actuarial Studies:

Clarke Leonie, Amarasuriya Kasun, Basrur Akshay, Chambers Oliver, Chen Honglin, Chen Qiao, Cheung Jeremiah, Dai Jiahua, Fang Jack, Feng Xu, Gao Rui, Goh Melvin, Hu Huiling, Huang Ruby, Jiang Su, , Li Han, Lin Xiaobing, Lin Jing, Liu Bixi, Luo Shuhong, Luo Qianjun, Neelakantan Niranjana, Negro Marcello, Ng Tun, Ong Yu, Ooi Pey, Phua Mei, See Sook, Tai Daniel, Tan Jiao, Tan Yan, Teng Hao, Thawiwatanachaikul Tim, Tong Ying, Wang Luya, Wang Steven, Wityasmoro Antya, Wongsodirdjo Leah, Wu Bing, Xu Angela, Yang Bijun, Yasinta Yolanda, Yeung Matthew, Yoon Vivienne, Zhou Runhang,

An Honours research essay has about 10,000 words and counts for 25% of the final assessment for a student's Honours grade. Seven Honours students did an essay in 2012, and the topics they studied were:

- Binomial trees, American put options and automatic methods of Greek, computation
- Characterising tail probabilities and some applications to asset price modelling using Lévy processes
- Evaluating the effectiveness of two stochastic mortality models using Hong Kong data
- Minimising the ruin probability in a Markov-modulated risk model with capital injections
- Joint distributions of some stopping times and number of claims in the compound binomial model
- The joint distribution of the time of ruin and number of gains in a dual risk model
- The convergence of the American barrier option on trinomial trees

The majority of students do three research projects instead of the essay. In 2012 the topics of those projects were:

- Statistics of stock rates of return
- Pricing options using Monte Carlo simulations
- Premium calculation under a Bayesian approach

# Student Prize Winners

## CENTRE AWARDS

### Actuarial Honours Prize (Medal)

Leonie Clarke

### ANZ Prize

For Advanced Financial Mathematics I and II

Nikita Kozlov

### Aviva Prize

For Contingencies

Nikita Kozlov

### Comminsure Prize

For Introduction to Actuarial Studies

Samuel Schonberger

### Deloitte Actuaries & Consulting Prize

For Actuarial Practice and Control I and II

Kasun Amarasuriya

### Institute of Actuaries of Australia Prize

For Research

Leonie Clarke

### Taylor Fry Prize

For Actuarial Statistics

Jing Fang

### Towers Perrin Prize

For Risk Theory I and II

Cheung Jeremiah Yee Man and Chambers Oliver Basil

### Martin Jilovsky Prize

For best third year results

Yining Feng

### Faculty of Business and Economics Medal

Timothy Lee

# PhD Students and Research Topics

## Evan Hariyanto

Pricing and risk management of reverse mortgages in the Australian market

## Jingchao Li

Finite time ruin problems

## Qing Liu

Bivariate claim modeling for general insurance; survival analysis of left truncated income protection insurance data

## Ciyu Nie

A lower barrier alerting system for risk processes

## Peter Raymond

Allowing for mortality uncertainty in life insurance models

## Navin Ranasinghe

Volatility derivatives

## Chao Yang

Generic algorithmic differentiation methods for computing financial derivative Greeks

## Robert Tang

New methods and improvements to Monte-Carlo methods for pricing derivative securities

## Dan Zhu

On fast and efficient computations of second order Greeks for financial products

# Publications and Other Research Activities in 2012

## Books

**Dickson D, Hardy M. and Waters H.** Solutions Manual for Actuarial Mathematics for Life Contingent Risks. Cambridge University Press, Cambridge.

**Fitzherbert R. and Pitt D.** Compound Interest and its Applications. University of Melbourne Custom Book Centre.

## Refereed Journal Articles

**Chin S and Dufresne D.** A general formula for option prices in a stochastic volatility model. *Applied Mathematical Finance* **19**(4): 313-340.

**Beveridge C. and Joshi M.** Interpolation schemes in the displaced-diffusion LIBOR market model. *SIAM Journal of Financial Mathematics*, **3**, 593 – 604.

**Beveridge C., Joshi M. and Wright W.** Efficient Pricing and Greeks in the Cross-Currency LIBOR Market Model. *Journal of Risk*, **14**(4), 65-113.

**Dickson D.** The joint distribution of the time to ruin and the number of claims until ruin in the classical risk model. *Insurance: Mathematics and Economics*, **50**(4), 334-337.

**Dickson D and Li S.** Erlang risk models and finite time ruin problems. *Scandinavian Actuarial Journal*, 2012, **3**, 183-202 .

**Jin Z., Yin G., and Zhu C.** Numerical solutions of optimal risk control and dividend optimization policies under a generalized singular control formulation. *Automatica*, **48**, 1489-1501

**Joshi M. and Chen T.** Truncation and acceleration of the Tian Tree for the pricing of American put options. *Quantitative Finance*, **33**(3), 1695-1708.

**Joshi M. and Staunton M.** On the analytical/numerical pricing of American put options against binomial tree prices. *Quantitative Finance*, **12**(1), 17-20.

**Joshi M. and Wiguna A.** Accelerating Pathwise Greeks in the Libor Market Model. *International Journal of Theoretical and Applied Finance*, **15**(2), 1 - 33.

**Wu X and Li S.** On a discrete time risk model with time-delayed claims and a constant dividend barrier. *Insurance Markets and Companies: Analyses and Actuarial Computations*, **3**(1), 50-57.

## Conference and Seminar Presentations

### Calderin, Enrique

Developing the collective risk model with the generalized discrete Lindley distribution, The 16th International Congress on Insurance: Mathematics and Economics, University of Hong Kong, Hong Kong, June.

A rich class of probability distributions to model count

data, 4th International Gerber-Shiu Workshop, The University of Melbourne, Melbourne, July.

### Chen, Ping

Optimal proportional reinsurance and investment with regime-switching for mean-variance insurers, 16th International Congress on Insurance: Mathematics and Economics, University of Hong Kong, Hong Kong, June.

### Dickson, David

On a risk model with capital injections. International Conference on Actuarial Science and Risk Management, Xiamen University, China, June (invited speaker).

On the distribution of the duration of negative surplus, 4th International Gerber-Shiu Workshop, University of Melbourne, Melbourne, July.

### Dufresne, Daniel

Gram-Charlier Distributions, 4th Micro-Conference on Probability and its Applications, University of Melbourne, March.

Gram-Charlier Distributions and Option Pricing, Concordia University, Montreal, July.

Gram-Charlier Distributions and Option Pricing, Monash University Econometrics Seminar, September.

### Li, Shuanming

Some finite-time ruin probabilities in the classical risk model with barriers, 16th International Congress on Insurance: Mathematics and Economics, University of Hong Kong, Hong Kong, June.

Some finite-time ruin probabilities in the classical risk model with barriers, 4th international Gerber-Shiu workshop, University of Melbourne, July.

On the generalisations of the expected discounted penalty function in some risk models, School of Mathematics, Nankai University, December.

### Jin, Zhuo

Numerical solutions of optimal risk control and dividend optimization policies with singular controls, Joint Seminar on Stochastic Processes and Financial Mathematics, Department of Mathematics, The University of Melbourne, Melbourne, March.

A numerical approach to optimal dividend policies with capital injections and transaction costs, 16th International Congress on Insurance: Mathematics and Economics, University of Hong Kong, Hong Kong, June.

Numerical solutions of optimal risk control and dividend optimization policies with singular controls. Minisymposium in 2012 SIAM Conference on Financial Mathematics and Engineering (FM12), Minneapolis, USA, July.

# Publications and Other Research Activities in 2012

## **Joshi, Mark**

Kooderive, Melbourne GPU User Group, VPAC, January.

Algorithmic Hessians, Bachelier Finance Society World Congress, Bachelier Finance Society, Sydney, June.

## **Taylor, Greg**

ERM—we are talking about for 10 years or so, but what is it? 5<sup>th</sup> Australasian Actuarial Education and Research Symposium, Monash University, Melbourne, December.

## **Wu, Xueyuan**

Equilibrium distributions of discrete phase-type distributions, 4<sup>th</sup> international Gerber–Shiu workshop, University of Melbourne, July.

## **Other Activities**

Professor David Dickson is an editor of ASTIN Bulletin, an associate editor of Insurance: Mathematics and Economics and Annals of Actuarial Science, a member of the editorial board of North American Actuarial Journal and an Adjunct Professor at the University of Waterloo. Actuarial Mathematics for Life Risks by David Dickson, Mary Hardy and Howard Waters was selected by the Society of Actuaries (USA) as reading for their Models for Life Contingencies exam, starting from the Spring 2012 exam diet.

Associate Professor Shuanming Li is a reviewer for American Mathematical Reviews (AMR) and Insurance Markets and Companies: Analyses and Actuarial Computations.

Professor Mark Joshi is a member of the Scientific Committee Marie Curie Risk Conference, and was PhD examiner for the University of Sydney.

Greg Taylor is an associate editor of Insurance: Mathematics and Economics, and a member of editorial board of Variance.

## **Involvement as Referees**

Acta Mathematicae Applicatae Sinica

Asian Journal of Control

ASTIN Bulletin

Bulletin of the Korean Mathematical Society

Communications in Statistics

Communications in Statistics—Theory and Methods

Electronic Journal of Probability

Insurance: Mathematics and Economics

Insurance Markets and Companies: Analyses and Actuarial Computations

Mathematical Modelling and Analysis

Performance Evaluation

Journal of Applied Probability

Journal of Optimization Theory and Applications

Journal of Industrial and Management Optimization

SIAM Journal on Control and Optimization

Scandinavian Actuarial Journal

Statistical Methodology

Statistics and Probability Letters

Natural Sciences and Engineering Research Council of Canada (NSERC)



# Research Paper Series

The Centre has an established Research Paper Series and abstracts of the papers published in 2012 are given below. Electronic versions of papers are available on the web at the following address: <http://www.economics.unimelb.edu.au/ACT/wps2012.shtml>

## No 224: Cobweb Theorems with production lags and price forecasting

By Daniel Dufresne and Felisa J. Vazquez-Abad

The classical cobweb theorem is extended to include production lags and price forecasts. Price forecasting based on a longer period has a stabilizing effect on prices. Longer production lags do not necessarily lead to unstable prices; very long lags lead to cycles of constant amplitude. The classical cobweb requires elasticity of demand to be greater than that of supply; this is not necessarily the case in a more general setting, price forecasting has a stabilizing effect. Random shocks are also considered.

## No 225: Unconditional distributions obtained from conditional specification models with applications in risk theory

By Emilio Gomez-Deniz and Enrique Calderin-Ojeda

Bivariate distributions, specified in terms of their conditional distributions, provide a powerful tool to obtain flexible distributions. These distributions play an important role in specifying the conjugate prior in certain multi-parameter Bayesian settings. In this paper, the conditional specification technique is applied to look for more flexible distributions than the traditional ones used in the actuarial literature, as the Poisson, negative binomial and others. The new specification draws inferences about parameters of interest in problems appearing in actuarial statistics. Two unconditional (discrete) distributions obtained are studied and used in the collective risk model to compute the right-tail probability of the aggregate claim size distribution. Comparisons with the compound Poisson and compound negative binomial are made.

## No. 226: The distributions of some quantities for Erlang(2) risk models

By David C.M. Dickson and Shuanming Li

We study the distributions of [1] the first time that the surplus reaches a given level and [2] the duration of negative surplus in a Sparre Andersen risk process with the interclaim times being Erlang(2) distributed. These distributions can be obtained through the inversion of Laplace transforms using the inversion relationship for the Erlang(2) risk model given by Dickson and Li (2010).

## No. 227: Gram-Charlier processes and equity-indexed annuities

By Jean-Pierre Chateau and Daniel Dufresne

A Gram-Charlier distribution has a density that is a polynomial times a normal density. The historical connection between actuarial science and the Gram-Charlier

expansions goes back to the 19th century. A critical review of the financial literature on the Gram-Charlier distribution is made. Properties of the Gram-Charlier distributions are derived, including moments, tail estimates, moment indeterminacy of the exponential of a Gram-Charlier distributed variable, non-existence of a continuous time Levy process with Gram-Charlier increments, as well as formulas for option prices and their sensitivities. A procedure for simulating Gram-Charlier distributions is given. Multiperiod Gram-Charlier modelling of asset returns is described, apparently for the first time. Formulas for equity indexed annuities' premium option values are given, and a numerical illustration shows the importance of skewness and kurtosis of the risk neutral density.

## No. 228: Survival analysis of left truncated income protection insurance data

By Qing Liu, David Pitt, Yan Wang, and Xueyuan Wu

One of the main characteristics of Income Protection Insurance (IPI) claim duration data, which has not been considered in the actuarial literature on the topic, is left-truncation. Claimants that are observed are those whose sickness durations are longer than the deferred periods specified in the policies, and hence left-truncation exists in these data. This paper investigates a series of conditional mixture models when applying survival analysis to model sickness durations of IPI claimants, and examines the consequence of treating the IPI data with lengthy deferred periods as complete data and therefore ignoring the left truncation by fitting the corresponding unconditional distributions. It also quantifies the extent of the bias in the resulting parameter estimates when ignoring the left-truncation in the data. Using the UK Continuous Mortality Investigation (CMI) sickness duration data, some well-fitting survival model results are estimated. It is demonstrated that ignoring the left-truncation in certain IPI data can lead to substantially different statistical estimates. We therefore suggest taking left-truncation into account by fitting conditional mixture distributions to IPI data. Furthermore, the best fitting model is extended by introducing a number of covariates into the conditional part to do regression analysis.

## No. 229: The finite time ruin probability in a risk model with capital injections

By Ciyu Nie, David C.M. Dickson, and Shuanming Li

We consider a risk model with capital injections as described in Nie et al. (2011). We show that in the Sparre Andersen framework the density of the time to ruin for the model with capital injections can be expressed in terms of

# Research Paper Series

the density of the time to ruin in an ordinary Sparre Andersen risk process. In the special case of Erlang inter-claim times and exponential claims we show that there exists a readily computable formula for the density of the time to ruin. When the inter-claim time distribution is exponential, we obtain an explicit solution for the density of the time to ruin when the individual claim amount distribution is Erlang(2), and we explain techniques to find the moments of the time to ruin. In the final section we consider the related problem of the distribution of the duration of negative surplus in the classical risk model, and we obtain explicit solutions for the (defective) density of the total duration of negative surplus for two individual claim amount distributions.

## **No. 230: Estimation of disability transition probabilities in Australia I: Preliminaries**

**By Evan A. Hariyanto, David C.M. Dickson, and David G.W. Pitt**

This is the first of two papers in which we estimate transition probabilities amongst levels of disability as defined in the Australian Survey of Disability, Ageing and Carers. In this paper we describe the main tools of our estimation and the estimation of the numbers of individuals in different disability categories at annual intervals using survey data that are available at five year intervals. In Paper II we describe our estimation procedure, followed by its implementation, discussion of results and graduation of the estimated transition probabilities.

## **No. 231: Estimation of disability transition probabilities in Australia II: Implementation**

**By Evan A. Hariyanto, David C.M. Dickson, and David G.W. Pitt**

This is the second of two papers in which we estimate transition probabilities amongst levels of disability as defined in the Australian Survey of Disability, Ageing and Carers. In this paper we describe our estimation procedure, followed by its implementation, discussion of results and graduation of the estimated transition probabilities.

## **No. 232: On the generalized Gerber-Shiu function for surplus processes with interest**

**By Shuanming Li and Yi Lu**

In this paper, we study the generalized expected discounted penalty (Gerber-Shiu) function in a risk process with credit and debit interests. We define  $T_{u,z}$  to be the first time that the surplus process drops below a certain level  $z$  from the initial surplus  $u$  ( $u \rightarrow z$ ). The time of ruin and the time of absolute ruin are special cases of this stopping time. The generalized Gerber-Shiu function is defined on three random variables: the first time that the surplus drops below  $z$  from  $u$ ,  $T_{u,z}$ , the surplus prior to  $T_{u,z}$ , and the amount by which the surplus is below  $z$ .

An explicit expression for the Gerber-Shiu function when  $u = z$  is obtained when credit and debit interest rates are equal, and explicit results for the Gerber-Shiu function under exponential claims are then obtained. Using these results, we investigate the probability that the surplus reaches an upper level without dropping below a lower level and the distribution of the maximum severity of ruin.

# Staff and Advisory Board

## Staff

### Professors of Actuarial Studies

DAVID C M DICKSON: BSc (Hons), PhD Heriot-Watt, FFA FIAA

Research Interests: Aggregate claims distributions, renewal risk processes, recursive methods in risk theory.

DANIEL DUFRESNE: BSc (Hons) Montreal, PhD The City University, FSA

Research Interests: Financial mathematics, actuarial science, probability.

MARK JOSHI: BA (Hons) Oxford, PhD MIT

Research Interests: Financial mathematics

### Associate Professor of Actuarial Studies

SHUANMING LI: BSc Tianjin, MEd Renmin, PhD Concordia

Research Interests: Risk and ruin theory, stochastic modelling in insurance and finance, actuarial science.

### Senior Lecturer of Actuarial Studies

XUEYUAN WU: BS, MS Nankai University China, PhD Hong Kong

Research Interests: Risk and Ruin theory, discrete-time risk models, phase-type distribution in Risk Theory

### Lecturers of Actuarial Studies

PING CHEN: BAM (Qufu), M.Sc (CAS), PhD (Hong Kong)

Research interests: Actuarial science, financial mathematics, statistics and information

ENRIQUE JAVIER CALDERIN: B.S., M.S (UNED, Spain), PhD (ULPGC, Spain) Research interests: Bayesian inference, statistical robustness, distribution theory, actuarial statistics

ZHUO JIN: B.S., M.S. (HUST), M.A., PhD (WSU) Research interests: Numerical methods for stochastic systems, mathematical finance, actuarial science

### Professorial Associate

GREG TAYLOR: BA, PhD, FIA, FIAA, FIMA, CMath, AO

Research Interests: Modelling in general insurance.

### Honorary Senior Fellows

RICHARD FITZHERBERT: BSc, FIA, FIAA, F Fin

JULES GRIBBLE: BSc (Hons), PhD St Andrews, FIAA, FCIA, FSA

### External Lecturers

DONALD CAMPBELL: BCom Melbourne, FIAA

DAVID HEATH: BEc (Hons) Monash, FIAA, CPA, F Fin

CARY HELENIUS: BSc (Hons), Dip Ed Melbourne, FIAA

### External Examiner for Part II

Martin Fry (APC 1&2)

Mike Barker (APC 3)

## Tutors

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Akshay Basrur

Jeremiah Cheung

Ruby Huang

Can Jin, BCom (Hons)

Jason Nassios

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Peter Raymond, BCom (Hons)

Tesfaye Seyoum

Melissa Tam, BCom (Hons)

Luya Wang

Wanjun Xu

Yubo Zhai, BCom (Hons)

William Zheng

Dan Zhu, BCom (Hons)

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AIG

Mr David McNiece

Watson Wyatt

Professor Greg Taylor

Taylor-Fry Consulting Actuaries

Mr Chris White

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Dean, Faculty of Economics and Commerce

Professor Nilss Olekalns

Head of Department (Economics)

Professor David Dickson

Centre for Actuarial Studies

Professor Daniel Dufresne

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Department of Economics

# Members



Dr. Enrique Calderin



Dr. Ping Chen



Professor David Dickson



Professor Daniel Dufresne

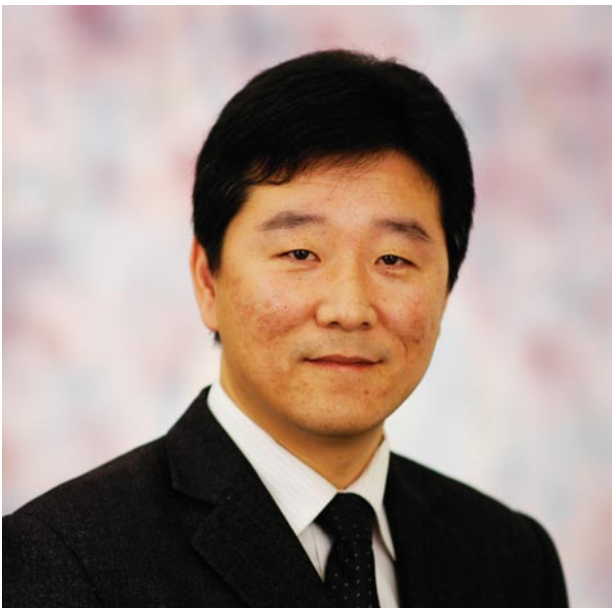
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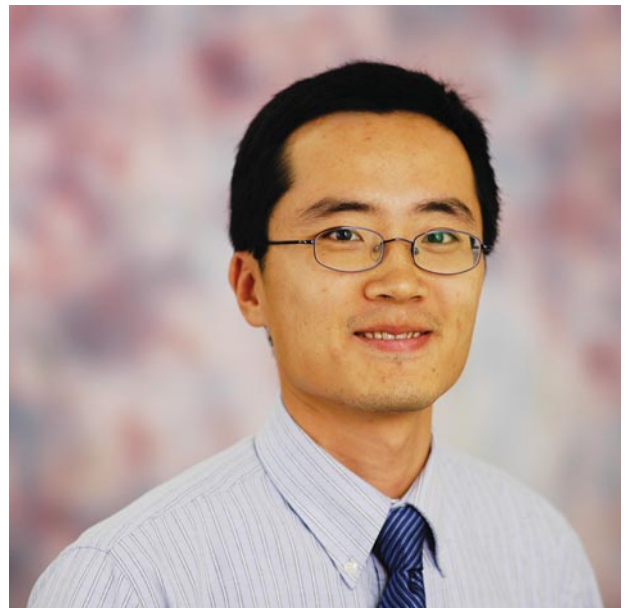
Dr. Zhuo Jin



Professor Mark Joshi



Associate Professor Shuanming Li



Dr. Xueyuan Wu



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