



THE UNIVERSITY OF
MELBOURNE

FACULTY OF
BUSINESS &
ECONOMICS



Centre for Actuarial Studies

ANNUAL REPORT 2016

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The Year in Review / Teaching

INTRODUCTION

The Centre for Actuarial Studies is a teaching and research unit located within the Department of Economics. The majority of undergraduate and Masters students study to become actuaries, but a number of our students find employment in the banking or investment sector. In particular, a number of our PhD students have research topics in the mathematical finance field. The Centre attracts high achieving students; many of the faculty's participants in the prestigious Chancellor's Scholars Program (admission to which is based on university entrance score) are students majoring in actuarial studies.

The Centre for Actuarial Studies is fully accredited by the Actuaries Institute, meaning that its students can obtain exemptions from all of Parts I and II of the Institute's examinations. With regard to research, 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 nine full-time academic staff and several part-time lecturers from the Melbourne actuarial community (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.

In December 2015, the Society of Actuaries (SOA) named the University of Melbourne's actuarial studies program as an SOA Center of Actuarial Excellence (CAE). Actuarial science school programs must meet eight rigorous criteria and specific CAE requirements to qualify for the CAE designation. These criteria involve the degree, curriculum, graduate count, faculty composition, graduate quality, appropriate integration, and connection to industry and research/scholarships. Only 30 colleges and universities around the world have attained the CAE designation.

Centre staff publish in top journals and present their research at seminars and conferences in Australia and overseas. Details of publications can be found later in this report, as well as a list of conference and seminar presentations.

STAFF NEWS RESEARCH AND GRANTS

Professor David Dickson was the Head of Department of Economics for 2016. Professor Mark Joshi was the director of the Centre. Associate Professor Shuanming Li was on a study leave from April 15 to July 17. Dr Kevin Fergusson joined the Centre as a senior lecturer in March. Both Dr

Enrique Calderin and Dr Zhuo Jin were confirmed in their positions in April and were promoted to Level C in September. Professor Daniel Dufresne resigned from the Centre and will leave The University of Melbourne in late February 2017.

Dr Enrique Calderin was awarded a Deans' certificate for research excellence based on his publications in 2015.

Professor David Dickson is an editor of ASTIN Bulletin, a member of the editorial board of Insurance: Mathematics & Economics, Annals of Actuarial Science and North American Actuarial Journal, and an Adjunct Professor at the University of Waterloo.

Dr Zhuo Jin is an editor of SIAM Activity Group on Control and Systems Theory Newsletter and a member of the editorial board of Journal of Systems Science and Complexity. Dr Jin was awarded a Deans' certificate for research excellence based on his publications in 2015.

Professor Mark Joshi is a managing editor of Quantitative Finance and an associate editor of the Review of Derivatives Research. Professor Joshi also organised a mini-conference on Numerical Methods in Equity and FX Modelling on 1st August in the Centre.

Associate Professor Shuanming Li was a member of the Program and Scientific Committee of the 6th International Workshop on Gerber-Shiu Functions. He is an External Reviewer for the journal Insurance Markets and Companies: Analyses and Actuarial Computations. Associate Professor Li was awarded a Deans' certificate for research excellence based on his publications in 2015.

Dr Xueyuan Wu was a member of the Scientific Committee of the 6th International Workshop on Gerber-Shiu Functions.

Dr Ping Chen and Professor Mark Joshi were awarded a Teaching Innovation Grant (\$8,000) for 2017 for their project entitled "Enhancing Actuarial Students' Study Efficiency and Practical Work Ability through E-learning".

Dr Kevin Fergusson, Dr Enrique Calderin and Dr Xueyuan Wu were awarded a 2017 Faculty Research Grant (\$17,108) for their project entitled "Predicting Floods and Claims for Insurers using Hierarchical Spatial Regression".

Dr Zhuo Jin was awarded a FBE Research Grant Support Scheme (\$20,000, 2017-18) for a project entitled "Insurance Portfolio and Dividend Management Using Stochastic Hybrid Systems". With Professor Hailiang Yang (HKU) and Dr Jinxia Zhu (UNSW), Dr Zhuo Jin was also awarded a Hong Kong RGC Grant 17330816 (HKD326,811, 2017-19) for their project entitled "A Study on Optimal Policies for Insurance Companies Amount". Analyses and Actuarial Computations.

The Year in Review / Teaching

TEACHING

Overall enrolments increased slightly from the level in previous years, in particular, the enrollment in Introduction to Actuarial Studies (ACTL 10001) increased by 12% to 267. There were 14 enrolments in the new 1.5-year M.Com (Actuarial Studies) degree. The M.Com (Actuarial Studies) degree has a 'practice' pathway, which focuses on advanced professional training, and a 'research' pathway, which prepares students for the PhD in Actuarial Studies. Enrolments at Honours level dropped from 28 in 2015 to 15 in 2016.

Teaching was supported by a number of external lecturers including Mr Richard Fitzherbert (Actuarial Practice and Control III), Dr Jane Joshi (Financial Mathematics III, Mathematics of Finance II), Mr David Heath, Mr Andrew Brown, Mr Donald Campbell, and Mr Andrew Gale (Actuarial Practice and Control I and II).

ENGAGEMENT

Dr Kevin Fergusson contributed two articles to the University of Melbourne's Election Watch for the July 2016 Australian Federal Election: "Pre-Election Policy Analysis: Superannuation" and "Hard and Difficult Debate on Super Will Not Go Away".

Professor Mark Joshi was involved in a number of open source projects. In particular, he continued to work on the Kooderive project for pricing derivatives using CUDA and C++. He was also an administrator of the widely used xlw project for interfacing C++ with EXCEL. In addition, he was organised a number of knowledge exchange events between academics and bankers in Melbourne.

PROFESSIONAL ACTIVITIES

Mr Richard Fitzherbert is a member of the Research Council Committee of the Actuaries Institute.

Dr Kevin Fergusson attended five seminars organised by the Actuaries Institute.

VISITORS AND SEMINARS

Dr Shuxiang Xie, from the Department of Probability and Statistics, School of Mathematics, Sun Yat-sen University, visited the Centre from 8th January to 26th February.

Professor David Pitt, from the Department of Applied Finance and Actuarial Studies, Macquarie University, visited the Centre from 25th to 27th January.

Associate Professor Guillaume Leduc, from the Department of Mathematics and Statistics, American University of Sharjah (UAE), visited the Centre from 27th July to 24th August.

Professor Kenneth Palmer, from the Department of Mathematics, National Taiwan University, visited the Centre in August.

Ms Merima Nurkanovic, from Technische Universitet Kaiserslautern, visited the Centre from 30th July to 12th August.

Prof Zhimin Zhang, from the College of Mathematics and Statistics, Chongqing University, visited the Centre from 5th August to 19th August.

Associate Professor Jiangyan Peng, from the School of Mathematical Sciences, University of Electronic Science and Technology of China, visited the Centre from 22nd to 27th August.

Associate Professor Xue Liang, from the Institute of Mathematics and Physics, Suzhou University of Science and Technology, visited the Centre from 16th Jan to 18th July.

Dr Chaolin Liu, from the Department of Statistics and Actuarial Science, Chongqing University, visited the Centre from 20th February 2016 to 20th February 2017.

Professor Piet De Jong, from the Department of Applied Finance and Actuarial Studies, Macquarie University, visited the Centre on 22nd April and gave a talk on "SM Bonds – a New Product for Managing Longevity Risk".

Associate Professor Gregoire Loeper, from the School of Mathematical Sciences, Monash University, visited the Centre on 29th April and gave a talk on "Option pricing with market impact and non-linear Black and Scholes equations".

Dr Mike Callan, from the Department of Econometrics and Business Statistics, Monash University, visited the Centre on 26th August and gave a talk on "Part II studies at Monash University".

Ms Liyuan Wang, from the School of Mathematics and Statistics, Xi'an Jiaotong University, visited the Centre from 1st September to 30th November and gave a talk entitled "Optimal portfolio with multiple risky assets for DC pension plans under inflation" on 9 September.

Associate Professor Jackie Li, from the Department of Applied Finance and Actuarial Studies, Macquarie University, visited the Centre on 26th September and gave a talk on "To Develop a Method of Assessing Basis Risk for Longevity Transactions".

Dr Boris Choy, from the Business School, University of Sydney, visited the Centre on 14th October and gave a talk on "Stochastic loss reserving modelling in general insurance using non-elliptical probability distributions".

Associate Professor Bernard Wong, from the School of Risk and Actuarial, UNSW, visited the Centre on 28th October and gave a talk on "On the interface between optimal periodic and continuous dividend strategies in the presence of transaction costs".

Teaching

Associate Professor Leonie Tickle, from the Department of Applied Finance and Actuarial Studies, Macquarie University, visited the Centre on 5th December and gave a talk on “New developments in coherent joint mortality modelling and forecasting”.

UNDERGRADUATE AND HONOURS CLASS SIZES

Subject Name	2014	2015	2016
ACTL10001 Introduction to Actuarial Studies	173	239	267
ACTL20001 Financial Mathematics I	117	121	165
ACTL20002 Financial Mathematics II	96	107	122
ACTL30001 Actuarial Modelling I	110	92	90
ACTL30002 Actuarial Modelling II	110	92	88
ACTL30003 Contingencies	84	77	77
ACTL30004 Actuarial Statistics	93	85	78
ACTL30005 Models for Insurance and Finance	85	85	77
ACTL30006 Financial Mathematics III	100	80	81
ACTL40001 Actuarial Studies Research Essay	3	5	3
ACTL40002 Risk Theory I	18	26	19
ACTL40003 Risk Theory II	11	10	11
ACTL40004 Advanced Financial Mathematics I	17	27	15
ACTL40005 Actuarial Studies Projects	14	24	12
ACTL40006 Actuarial Practice and Control I	36	43	13
ACTL40007 Actuarial Practice and Control II	30	41	10
ACTL40008 Advanced Financial Mathematics II	8	7	7
ACTL40009 Actuarial Practice and Control III	27	33	7
Total Enrolments	1132	1194	1142

HONOURS ESSAY AND PROJECT TOPICS

There are 15 students successfully completed a Bachelor of Commerce (Honours) with a specialisation in Actuarial Studies.

An Honours research essay has about 10,000 words and counts for 25% of the final assessment for a student’s Honours grade. Three Honours students wrote an essay in 2015, and the topics were:

- A new approximation of the ultimate ruin probability in the classical risk model
- Efficiency and accuracy of pricing derivatives using different approximate distributions in the Heston model
- Pricing longevity linked derivatives using a stochastic mortality model

Associate Professor Johnny Li, from the Department of Statistics and Actuarial Science, University of Waterloo, visited the Centre on 5th and 6th December and gave a talk on “Semi-Coherent Multi-Population Mortality Modeling: The Impact on Longevity Risk Securitization”.

HONOURS GRADES OVER THE LAST FIVE YEARS

	H1	H2A	H2B	H3	N	Total
2012	12	12	15	6	0	45
2013	10	9	13	2	4	38
2014	5	6	4	2	0	17
2015	2	7	12	3	4	28
2016	4	3	4	3	1	15

MASTERS CLASS SIZES

Subject Name	2014	2015	2016
ACTL90001 Mathematics of Finance I	15	12	15
ACTL90002 Mathematics of Finance II	13	11	11
ACTL90003 Mathematics of Finance III	16	11	22
ACTL90004 Insurance Risk Models	17	11	25
ACTL90005 Life Contingencies	12	10	7
ACTL90006 Life Insurance Models 1	15	11	16
ACTL90007 Life Insurance Models 2	15	11	13
ACTL90008 Statistical Techniques in Insurance	15	13	6
ACTL90009 Actuarial Practice and Control III	3	22	2
ACTL90010 Actuarial Practice and Control I	3	6	18
ACTL90011 Actuarial Practice and Control II	3	4	13
ACTL90012 Actuarial Studies Research Essay	2	1	1
ACTL90013 Actuarial Studies Project	0	0	7
ACTL90014 Insurance risk models II	2	0	8
ACTL90015 Mathematics of Finance IV	0	0	3
Total Enrolments	131	111	167

The majority of Honours students do three research projects instead of the essay. In 2015 the topics of those projects were:

- Self-funded superannuation: investment and longevity risks
- Mean variance analysis in factor models
- Some numerical studies on ruin probability approximations

Student Prize Winners

Actuaries Institute Prize

for Research Essay and Projects

Mengtong Xia

Deloitte Actuaries & Consulting Prize

for Actuarial Practice and Control I and II

Daniel Langford

Honours Medal in Actuarial Studies

Mengtong Xia

KPMG Prize

for Financial Mathematics I and II

Kevin Li

KPMG Prize

for Second Year Actuarial Studies

Max Yang

Martin Jilovsky Prize

for best third year results by an Australian student

David Kwak

Taylor Fry Prize

for Actuarial Statistics

David Kwak

Trimantium Capital Award

for Financial Mathematics III

David Kwak

Willis Towers Watson Prize

for Risk Theory I and II

Mengtong Xia

PhD Students and Research Topics

Xiang Cheng

Optimal control and Monte Carlo

Pham Le

On non-arbitrage theory in markets with transactions costs and associated processes

Joan Nakoto

Superannuation: Its challenges and recommendations

Navin Ranasinghe

Volatility derivatives

Miao Zhang

Continuous time mean-variance model for portfolio selection

Nan Zhang

Some optimal reinsurance problems

Zhehao Zhang

Present value distribution of aggregated discounted claims

Three PhD students, Can Jin, Marjan Qazvini and Dan Zhu, completed their PhD theses. Dan Zhu graduated in May and Marjan graduated in December. Can Jin joined Bond University as a lecturer in actuarial science in January and Dan Zhu joined the department of Econometrics and Business Statistics at Monash University as a lecturer in March.

Publications and Other Research Activities

REFEREED JOURNAL ARTICLES

Bulut Karageyik, B., Dickson, D.C.M. – Optimal reinsurance under multiple attribute decision making. *Annals of Actuarial Science*, **10**, 65-86.

Calderin, E., Azpitarte, F., Gomez-Deniz, E. – Modelling income data using two extensions of the exponential distribution. *Physica A: Statistical Mechanics and its Applications*, **461**, 756-766.

Calderin, E. – The distribution of all French communes: A composite parametric approach. *Physica A: Statistical Mechanics and its Applications*, **450**, 385-394.

Calderin, E.; Kwok, C. F. – Modelling claims data with composite Stoppa models. *Scandinavian Actuarial Journal*, **9**, 817-836.

Dickson, D.C.M. – A note on some joint distribution functions involving the time of ruin. *Insurance: Mathematics & Economics*, **67**, 120-124.

Dickson, D.C.M., Qazvini, M. – Gerber-Shiu analysis of a risk model with capital injections. *European Actuarial Journal*, **6**, 409-440.

Gomez-Deniz, E., Calderin, E. – The Poisson-conjugate Lindley mixture distribution. *Communications in Statistics: Theory and Methods*, **45**(10), 2857-2872.

Jin, C., Li, S., Wu, X. – On the occupation time in a delayed Sparre Andersen risk model with exponential claims. *Insurance: Mathematics and Economics*, **71**, 304-316.

Jin, Z., Qian, L., Wang, W., Wang, R. – Pricing dynamic fund protections with regime switching. *Journal of Computational and Applied Mathematics*, **297**, 13-25.

Joshi, M.S. – Analyzing the Bias in the Primal-Dual Upper Bound Method for Early Exercisable Derivatives: Bounds, Estimation and Removal. *Quantitative Finance*, **16**(4), 519-533.

Joshi, M.S., Kwon, O.K. – Least Squares Monte Carlo Credit Value Adjustment with Small and Unidirectional Bias. *International Journal of Theoretical and Applied Finance*, **19**(8), 1650048.

Joshi, M.S., Ranasinghe, N. – Non-Parametric Pricing of Long-Dated Volatility Derivatives Under Stochastic Interest Rates. *Quantitative Finance*, **16**(7), 997-1008.

Joshi, M.S., Zhu, D. – An Exact and Efficient Method for Computing Cross-Gammas of Bermudan Swaptions and Cancellable Swaps Under the Libor Market Model. *Journal of Computational Finance*, **20**(1), 113-137.

Joshi, M.S., Zhu, D. – An Exact Method for the Sensitivity Analysis of Systems Simulated by Rejection Techniques. *European Journal of Operational Research*, **254**, 875-888.

Joshi, M.S., Zhu, D. – Optimal Partial Proxy Method for Computing Gammas of Financial Products with

Discontinuous and Angular Payoffs. *Applied Mathematical Finance*, **23**(1), 22-56.

Joshi, M.S., Zhu, D. – The Robust Computation and the Sensitivity Analysis of Finite-time ruin Probabilities and the Estimation of Risk-Based Regulatory Capital. *ASTIN Bulletin*, **46**(2), 431-467.

Li, J., Dickson, D.C.M., Li, S. – Analysis of some ruin-related quantities in a Markov-modulated risk model. *Stochastic Models*, **32**, 351-365.

Li, S., Lu, Y. – On the time and the number of claims when the surplus drops below a certain level. *Scandinavian Actuarial Journal*, **5**, 420-445.

Li, S., Lu, Y., Jin, C. – Number of jumps in two-sided first exit problems for the compound Poisson process. *Methodology and Computing in Applied Probability*, **18**(3): 747-764.

Wang, W., Jin, Z., Qian, L., Su, X. – Local risk minimization for vulnerable European contingent claims on non-tradable assets under regime switching models. *Stochastic Analysis and Applications*, **34**(4), 662-678.

Wu, F., Yin, G., Jin, Z. – Kolmogorov-type systems with regime-switching jump diffusion perturbations. *Discrete and Continuous Dynamical Systems – Series B*, **21**(7), 2293-2319.

Yao, H., Chen, P., Li, X. – Multi-period defined contribution pension funds investment management with regime switching and mortality risk. *Insurance: Mathematics and Economics*, **71**, 103-113.

Zhang, M., Chen, P. – Mean-variance asset-liability management under constant elasticity of variance process. *Insurance: Mathematics and Economics*, **70**, 11-18.

Zhang, M., Chen, P. – Mean-variance portfolio selection with regime switching under shorting prohibition. *Operation Research Letters*, **44**(5), 658-662.

Zhang, N., Jin, Z., Li, S., Chen, P. – Optimal reinsurance under dynamic VaR constraint. *Insurance Mathematics and Economics*, **71**, 232-243.

CONFERENCE AND SEMINAR PRESENTATIONS

Calderín, Enrique

“Modelling income distributions with zero incomes”. University of Cantabria, July.

Cheng, Xiang

“Non-nested upper bounds for American options”. University of Melbourne, December.

Fergusson, Kevin

“Prediction of Extreme Rainfall Events and Flood Events in Australia”. University of Melbourne, November.

Publications and Other Research Activities

“Preliminary Work on Predicting Floods and Extreme Rainfall Events in Australia”. General Insurance Seminar, November.

“Pricing and risk management of reverse mortgages under the benchmark approach”. University of Melbourne, December.

“Pricing and Risk Management of Reverse Mortgages”. The Quantitative Methods in Finance (QMF) 2016 Conference, University of Technology, Sydney December.

Jin, Zhuo

“Dividend Optimization under Liability Constraints”. East China Normal University, July.

“Some Problems in Dividend Optimization and Debt Management”. RSFAS Summer Research Camp 2016, Australian National University, November.

“Liability Management and Dividend Optimization”. The Quantitative Methods in Finance (QMF) 2016 Conference, University of Technology Sydney, December.

Joshi, Mark

“A new class of dual upper bounds for early exercisable derivatives encompassing both the additive and multiplicative upper bounds”. Applied Financial Modelling Conference, Deakin, February.

“Analyzing the bias in the primal-dual upper bound method for early exercisable derivatives: bounds, estimation and removal”. University of Melbourne, December.

“The Bias in the Primal-Dual Simulation Method for Upper Bounds of Bermudan Options”. The Quantitative Methods in Finance (QMF) 2016 Conference, University of Technology Sydney, December.

Li, Shuanming

“On the discounted aggregate claims occurred in some states in a MAP risk process”. Simon Fraser University, July.

Wu, Xueyuan

“On the occupation times in a delayed Sparre Andersen risk model with exponential claims”. East China Normal University, December.

Zhang, Nan

“Markowitz’s mean-variance optimization with investment and constrained reinsurance”. The 20th International Congress on Insurance Mathematics and Economics (IME 2016), Georgia State University, July.

“Some Problems on Optimal Reinsurance Programs”. The University of Newcastle, September.

“Some Optimal Reinsurance Problems with Risk Management”. Shenzhen University, November.

“Some Optimal Reinsurance Problems with Risk Management”. Qufu Normal University, November.

“Some Optimal Reinsurance Problems with Risk Management”. Chongqing University, November.

“Some Optimal Reinsurance Problems with Risk Management”. East China Normal University, December.

“Optimal reinsurance under dynamic VaR, CVaR and worst-case CVaR constraints”. The Quantitative Methods in Finance (QMF) 2016 Conference, University of Technology Sydney, December.

OTHER ACTIVITIES

A PhD student of the Centre acted as a referee for *The 28th Chinese Control and Decision Conference*, Yinchuan. Staff of the Centre acted as reviewer for a doctoral thesis entitled “Essays on energy and sustainable economy: A methodological approach based on the analysis of inequality”, University of Cantabria. Three members of the Centre, Dr Zhuo Jin, Associate Professor Shuanming Li and Dr Xueyuan Wu, were reviewers for American Mathematical Reviews.

INVOLVEMENT AS REFEREES

Staff of the Centre acted as referees for the following journals:

Applicable Analysis

Applied Mathematical Modelling

Applied Mathematics and Optimization

Asia-Pacific Journal of Risk and Insurance

ASTIN Bulletin

Communication in Statistics: Theory and Methods

Computational Statistics and Data Analysis

Economics: The Open-Access, Open-Assessment E-Journal

Frontiers of Mathematics in China

Hacettepe Journal of Mathematics and Statistics

IEEE Transactions on Automatic Control

Insurance: mathematics and Economics

International Journal of Decision Sciences, Risk and Management (IJDSRM)

International Journal of Production Research

Journal of Applied Statistics

Journal of Industrial and Management Optimization

Journal of Statistical Theory and Practice

Methodology & Computing in Applied Probability

Physica A: Statistical Mechanics and its Applications

Risks

Scandinavian Actuarial Journal

Soft computing

Statistics and Probability Letters

Stochastic Models

Stochastics

Staff

STAFF

Director of the Centre for Actuarial Studies

Professor MARK JOSHI:
BA (Hons) (Oxford), PhD (MIT)
Research interests: Financial mathematics

Professors of Actuarial Studies

DAVID DICKSON:
BSc (Hons), PhD (Heriot-Watt), FFA, FIAA
Research interests: Aggregate claims distributions, renewal risk processes, recursive methods in risk theory.

DANIEL DUFRESNE:
BSc (Montreal), PhD (The City University), FSA
Research interests: Financial mathematics, actuarial science, probability

Associate Professor in 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 in Actuarial Studies

ENRIQUE CALDERIN:
BS, MS (UNED, Spain), PhD (ULPGC, Spain)
Research interests: Bayesian inference, statistical robustness, distribution theory, actuarial statistics

KEVIN FERGUSSON:
BSc (Hons), MSc, PhD, FIAA, CERA
Research interests: Stochastic analysis and modelling, superannuation and insurance services

ZHUO JIN:
BS, MS (HUST), MA, PhD (WSU), ASA
Research interests: Numerical methods for stochastic systems, mathematical finance, actuarial science

XUEYUAN WU:
BS, MS (Nankai), PhD (Hong Kong), AIAA
Research interests: Risk and ruin theory, discrete-time risk models, phase-type distributions in risk theory

Lecturer in Actuarial Studies

PING CHEN:
BAM (Qufu), MSc (CAS), PhD (Hong Kong)
Research interests: Actuarial science, financial mathematics, statistics and information

Honorary Senior Fellows

RICHARD FITZHERBERT:
BSc (Sydney), FIAA, FFin

DAVID HEATH:
BEd (Hons) (Monash), FIAA, CPA, FFin

External Lecturers

ANDREW BROWN:
BSc, DipEd (Melbourne), FIAA, FFin

DONALD CAMPBELL:
BCom (Melbourne), FIAA

ANDREW GALE:
BSc (Melbourne), FIAA

JANE JOSHI:
BSc (Hons) (Monash), PhD (Melbourne)

External Examiners for Part II

MARTIN FRY and ANDREW GALE
(Actuarial Practice and Control I and II)

MIKE BARKER
(Actuarial Practice and Control III)

Staff



Professor Mark Joshi



Professor David Dickson



Professor Daniel Dufresne

Staff



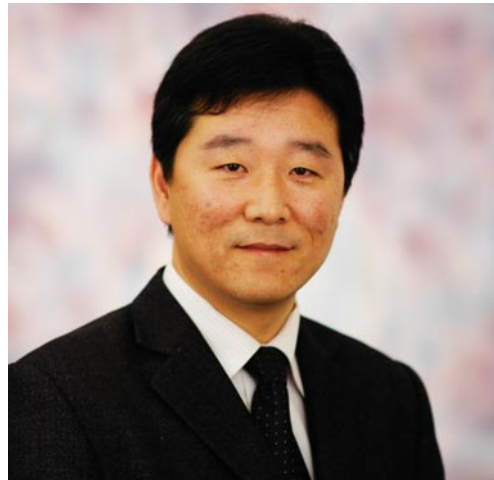
Dr. Enrique Calderin



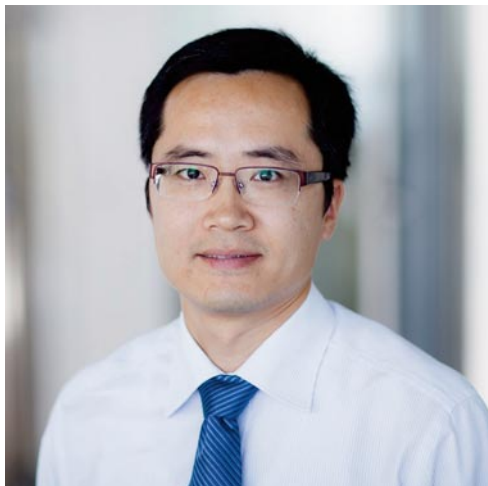
Dr. Ping Chen



Dr. Zhuo Jin



Associate Professor Shuanming Li



Dr. Xueyuan Wu



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