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 banking or investments; in particular, a number of our PhD students have research topics in financial mathematics. 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 eight 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 Mark Joshi has acted as Director of the Centre since January 2015. Professor Dickson was on a study leave in the second half of the year 2015. Dr. Kevin Fergusson has accepted an academic position in the unit and he will join the Centre as a senior lecturer in March 2016. Prior to that, Kevin was a senior lecturer at the Department of Mathematics and Statistics at Curtin University.

Dr Enrique Calderin received the best oral presentation award in the International Conference on Applied Statistics, ICAS 2015. In addition, he was awarded a Deans’ certificate for research excellence based on his publications in 2014.

Professor David Dickson is an editor of ASTIN Bulletin, an associate editor of Insurance: Mathematics & 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.

Professor Daniel Dufresne was an invited speaker at the 5th Monash-Ritsumeikan Symposium on Probability and Related Fields, hosted by Monash University in March, and an invited speaker at the Symposium in Memory of Marc Yor, hosted by Universite Paris 7 in June.

Dr. Zhuo Jin is an editor of SIAM Activity Group on Control and Systems Theory Newsletter, an associate editor of conference proceedings editorial board - The 54th IEEE Conference on Decision and Control Technical program committee member, and an associate editor for the proceedings - The 28th Chinese Control and Decision Conference. He is also a member of the editorial board of Journal of Systems Science and Complexity and a member of the group in stochastic control, and the technical committee on control theory of the Chinese Association of Automation.

Professor Mark Joshi is a managing editor of Quantitative Finance and was a member of the Scientific Committee of the Second International Conference on Mathematics and Statistics AUS-ICMS.

Associate Professor Shuanming Li is an External Reviewer for the journal Insurance Markets and Companies: Analyses and Actuarial Computations.

TEACHING
Overall enrolments increased slightly from the level in previous years, in particular, the enrollment in Introduction to Actuarial Studies (ACTL 10001) increased by 38% to 239. Enrolments at Masters level dropped slightly. The Centre introduced a new 1.5-year M.Com (Actuarial Studies) degree to replace the 2-year one for students completing the B.Com degree with the first students commencing in 2016. 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.
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 Enrique Calderin gave guidance on the use of the software package R to the insurance company AIA.
Professor Mark Joshi assisted Nick Dunbar Ltd with mathematical modelling. In Dunbar’s words: “Prof Joshi provided expert advice on complex bank loan contracts to the producer of a documentary by UK broadcaster Channel 4 on local authority borrowing, which was watched by 1.1 million viewers and led to an inquiry by a UK parliamentary committee”
Professor Mark Joshi continued to administrate and contribute to the Kooderive, xlw and QuantLib open source projects. He was a member of the Moneyscience advisory board.

PROFESSIONAL ACTIVITIES
Dr Zhuo Jin attended the 7th Australasian Actuarial Education and Research Symposium at Bond University in December.
Mr Richard Fitzherbert is a member of the Research Council Committee of the Actuaries Institute.

VISITORS AND SEMINARS
Professor Felisa Vázquez-Abad, from City University of New York, visited the Centre in January and February.
Professor Paul SF Yip, from the Centre for Suicide Research and Prevention, Hong Kong University, visited the Centre on March 23 and gave a talk on “Geography of suicide in HK: Spatial patterning, and socioeconomic correlates and inequalities”.
Professor Ken Siu, from the Department of Applied Finance and Actuarial Studies, Macquarie University, visited the Centre on June 9 and 10 and gave a talk on “A Self-Exciting Threshold Jump-Diffusion Model for Option Valuation”.
Professor Dietmar P.J. Leisen, from Gutenberg School of Management and Economics, University of Mainz, Germany, visited the Centre on August 31 and gave a talk on “A Perturbation Approach to Continuous-time Portfolio Selection”.
Dr Farzad Alavi Fard, from School of Economics, Finance and Marketing, RMIT University, visited the Centre on October 26 and gave a talk on “A Non-Parametric Approach to Modeling Electricity Spikes”.
Dr Kevin Fergusson, from the Department of Mathematics and Statistics, Curtin University, visited the Centre on October 30 and gave a talk on “Pricing and Hedging Extreme-Maturity Interest Rate Derivatives and Equity Index Options”.
Associate Professor David Pitt, from the Department of Applied Finance and Actuarial Studies, Macquarie University, visited the Centre from November 17 to 19.
Professor Hansjoerg Albrecher, from Université de Lausanne, Switzerland, visited the Centre from December 19 to 24 and gave a talk on “Randomized Observations in Risk Theory”.

UNDERGRADUATE AND HONOURS CLASS SIZES

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Teaching

HONOURS GRADING OVER THE LAST FIVE YEARS

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HONOURS ESSAY AND PROJECT TOPICS

The following students successfully completed a Bachelor of Commerce (Honours) with a specialisation in Actuarial Studies: Annie Chen, Gege Cheng, Yun Kitt, Kenny Choo, Aiden Chung, Yufan Deng, Christopher Ebeling, Jevon Fulbrooke, Yu Gai, Joseph Tue Giang, Weiwei He, Masihyar Khan, Daryl Zhen Hui Lee, Steve Lim, Yuan Ma, Rowena Qiu, Yanzhong Qiu, Desmond Tam, Zhenyu Wang, Shao Sheng Wang, Chun Hang, Dennis Wong, Zhengmao Yang, Dominic Zhang, Kevin Zheng, Angela Zhou.

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

- On the efficiency of the quadratic exponential scheme of the Heston stochastic volatility model
- Australian Betting Markets: A probit analysis
- Reverse mortgages
- Post-IPO share price pattern in China
- Optimal consumer lifetime insurance coverage

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

- Derivative pricing with non-constant stock volatilities
- Life cycle investment strategies
- Investment and portfolio allocation
Student Prize Winners

Actuaries Institute Prize
for Research Essay and Projects
Yaozhong Qiu

Comminsure Prize
for Introduction to Actuarial Studies
Yanchao Yang

Deloitte Actuaries & Consulting Prize
for Actuarial Practice and Control I and II
Yaozhong Qiu

Honours Medal in Actuarial Studies
Yaozhong Qiu

Trimantium Capital Award
for Financial Mathematics III
Holly Briffa

Martin Jilovsky Prize
for best third year results by an Australian student
Mengtong Xia

Taylor Fry Prize
for Actuarial Statistics
Mengtong Xia

Towers Watson Prize
for Risk Theory I and II
Annie Chen

PhD Students and Research Topics

Xiang Cheng
Optimal control and Monte Carlo

Can Jin
On occupation times in some insurance risk models

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

Marjan Qazvini
Risk models with capital injections

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

Dan Zhu
On fast and efficient computations of second order Greeks for financial products
### REFEREED JOURNAL ARTICLES


### OTHER PUBLICATIONS


Joshi, M.S. *Proof Patterns*, Springer March 2015.

### CONFERENCE AND SEMINAR PRESENTATIONS

Calderin, Enrique


Dickson, David

- “The time of ruin in a Markov-modulated risk model”. Heriot–Watt University, August.
- “The time of ruin in a Markov-modulated risk model”. University of Barcelona, September.
- “The time of ruin in a Markov-modulated risk model”. ISEG, University of Lisbon, October.
- “Analysis of a risk model with capital injections”. Heriot–Watt University, November.
- “Analysis of a risk model with capital injections”. ETH, Zurich, December.
**Publications and Other Research Activities**

**Dufresne, Daniel**

"In Memory of Marc Yor", 5th Ritsumeikan-Monash Symposium on Probability and Related Fields, Monash University, March.

"Some two-dimensional extensions of Bougerol¹s identity in law for the exponential functional of linear Brownian motion". The 5th Monash-Ritsumeikan Symposium on Probability and Related Fields, Monash University, March.

"Marc Yor’s contribution to the pricing of Asian options". Symposium in Memory de Marc Yor, Universite Paris 7, June.

"Pricing Asian options: Convergence of Gram-Charlier series". ASTIN AFIR/ERM and IACA Colloquia, Sydney, August.

"Pricing Asian options: Two techniques". The 59th Meeting of the Australian Mathematical Society, Flinders University, Adelaide, September.

"Change of dimension for pricing Asian options:Upsizing". Hunter College, City University of New York, December.

"Convergence of Gram-Charlier series". Hunter College, City University of New York, December.

**Jin, Zhuo**


"Lookback option pricing for regime-switching jump diffusion models". Minisymposium co-organizer and speaker in SIAM Conference on Control and Its Applications (CT15), Paris, July.

**Jin, Can**

"On the occupation times for the surplus process being below or above a certain level prior to ruin in a classical risk model". The 7th Australasian Actuarial Education and Research Symposium, Bond University, December.

**Joshi, Mark**

"Kooderive: Multi-Core Graphics Cards, the Libor Market Model, Least-Squares Monte Carlo and the Pricing of Cancellable Swaps," University of Technology, Sydney, May.

"Using GPUs to price derivatives". The Quantitative Methods in Finance (QMF) 2015 Conference, University of Technology, Sydney, December.

**Zhu, Dan**


"An exact method for the sensitivity analysis of systems simulated by projection techniques". Department of Econometrics and Business Statistics, Monash University, November.

**Other Activities**

Staff of the Centre acted as a referee for Institute and Faculty of Actuaries (IFA) Research Funding. 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:**

- Advances in Difference Equations
- Annals of Actuarial Science
- Applied Mathematical Finance
- Applied Stochastic Models in Business and Industry
- Asia-Pacific Journal of Risk and Insurance
- ASTIN Bulletin
- The Australian Economic Review
- Automatica
- Communications in Statistics – Simulation and Computation
- Computational and Applied Mathematics
- Computational Statistics and Data Analysis
- Economic Modelling
- European Actuarial Journal
- Finance and Stochastics
- Insurance: Mathematics & Economics
- International Journal of Decision Sciences, Risk and Management (UDSRM)
- Journal of Computational and Applied Mathematics
- Journal of Mathematical Finance
- Journal of Industrial and Management Optimization
- Journal of Optimization Theory and Applications
- Journal of Risk and Financial Management
- Mathematical Methods of Operations Research
- Risks
- Scandinavian Actuarial Journal
- Science in China Mathematics
- Statistical Methodology
- Statistics and Probability Letters
STAFF

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 (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

Research Interests:
- Aggregate claims distributions
- Renewal risk processes
- Recursive methods in risk theory
- 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
XUEYUAN WU: BS, MS (Nankai), PhD (Hong Kong)
Research interests: Risk and ruin theory, discrete-time risk models, phase-type distribution in risk theory

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

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

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

Honorary Senior Fellows
RICHARD FITZHERBERT
BSc (Sydney), FIAA, FFin

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

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

Dr. Enrique Calderin

Dr. Ping Chen

Professor David Dickson

Professor Daniel Dufresne