Oscar Peralta-Gutiérrez

Dept. of Actuarial Science and Insurance
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Education

2019	Ph.D., Applied Mathematics, Danmarks Tekniske Universitet Thesis: Advances of matrix-analytic methods in risk theory Supervisors: Bo Friis Nielsen & Mogens Bladt
2014	M.Sc., Mathematical Sciences, graduated with Honors and Best M.Sc. thesis Award in Mathematics, Universidad Nacional Autónoma de México Thesis: Strassen's theorem and erlangization: applications to risk theory Supervisor: Mogens Bladt
2012	B.Sc., Actuarial Sciences, graduated with Honors, Universidad Nacional Autónoma de México Thesis: Risk models with PH and ME–distributed claims *(in Spanish)* Supervisor: Mogens Bladt

Current Research Interests

- Dependence modelling and risk measures
- Heavy-tailed and rare event phenomena
- Systemic risk and common shocks modelling
- Ruin probabilities in non-life insurance mathematics
- Policy valuation in life-insurance mathematics
- Matrix-analytic methods and other computationally efficient tools
- Simulation schemes for hybrid stochastic differential equations
- Strong convergence of stochastic processes
- Statistical inference for stochastic processes

Selected Awards and Qualifications

2021 ACEMS Research Support Scheme: Regime-switching and hybrid stochastic differential equations (9,360 AUD)

2021 ACEMS Research Support Scheme: First passage properties of Markov additive processes and related multivariate processes (7,500 AUD)

2019 ACEMS International Mobility Programme Travel Award (9,300 AUD)

2019 ECMS–The University of Adelaide Overseas Conference Leave Scheme (2,900 AUD)

2015 CONACYT full scholarship for the period for Ph.D. programme abroad (90,000 EUR)

2015 University of Queensland Summer Research Scholarship (3,400 AUD)

2015 IIMAS-UNAM Travel Award (1,700 AUD)

2013 CONACYT scholarship for the period for M.Sc. studies (200,000 MXN)

Academic Appointments

Instituto Tecnológico Autónomo de México	01/2024–current	Associate Professor - Level C
Cornell University	01/2023– 12/2023	Postdoctoral Researcher
Université de Lausanne	12/2021– 11/2022	SNSF Senior Researcher
The University of Adelaide	12/2021– current	Adjunct Lecturer
	03/2020–07/2020	Course Coordinator
	08/2018–11/2021	ARC Research Associate
Danmarks Tekniske Universitet	09/2015–08/2018	Research Assistant
	06/2016–06/2017	Teaching Assistant
Universidad Nacional Autónoma de México	06/2012–06/2015	Teaching Assistant

Publications

Authorship in alphabetical order

Accepted

[1] M Bladt & O Peralta (2024). *Strongly convergent homogeneous approximations to inhomogeneous Markov jump processes*. To appear in **Mathematics of Operations Research**. Retrieved from https://arxiv.org/abs/2204.02954

[2] O Peralta & M Simon (2023). *Ruin problems for risk processes with dependent phase-type claims*. **Methodology and Computing in Applied Probability** 25. DOI: 10.1007/s11009-023-10065-8

[3] H Albrecher & O Peralta (2023). *The matrix sequential probability ratio test and multivariate ruin theory*. **2022 MATRIX Annals**. Retrieved from https://www.matrix-inst.org.au/2021-matrix-annals/

[4] ECK Cheung, O Peralta & JK Woo (2022). *Multivariate matrix-exponential affine mixtures and their applications in risk theory*. **Insurance: Mathematics and Economics** 106. DOI: 10.1016/j.insmatheco.2022.07.001

[5] N Bean, GT Nguyen, BF Nielsen & O Peralta (2022). *RAP-modulated fluid process: first passages and stationary distribution*. **Stochastic Processes and their Applications** 149. DOI: 10.1016/j.spa.2022.03.013

[6] G Latouche, GT Nguyen & O Peralta (2022). *Strong convergence to two-dimensional alternating Brownian motion process*. **Stochastic Models** 38. DOI: 10.1080/15326349.2022.2066129

[7] O Peralta (2022). *A Markov jump process associated with the matrix-exponential distribution*. **Journal of Applied Probability**. DOI: 10.1017/jpr.2022.25

[8] GT Nguyen & O Peralta (2022). *Rate of strong convergence to Markov-modulated Brownian motion*. **Journal of Applied Probability** 59. DOI: 10.1017/jpr.2021.30

[9] GT Nguyen & O Peralta (2020). *An explicit solution to the Skorokhod embedding problem for double exponential increments*. **Statistics and Probability Letters** 165. DOI: 10.1016/j.spl.2020.108867

[10] M Bladt, BF Nielsen, & O Peralta (2019). *Parisian types of ruin probabilities for a class of dependent risk-reserve processes*. **Scandinavian Actuarial Journal** 1. DOI: 10.1080/03461238.2018.1483420

[11] O Peralta, L Rojas-Nandayapa, W Xie, H Yao (2018). *Approximation of ruin probabilities via erlangized scale mixtures*. **Insurance: Mathematics and Economics** 78. DOI: 10.1016/j.insmatheco.2017.12.005

Submitted

[1] M Bladt, A Minca & O Peralta. *Pathwise and distributional approximations of semi-Markov processes*. Submitted to Finance and Stochastics. Retrieved from https://arxiv.org/abs/2312.06784

[2] P Huo, O Peralta, J Guo, Q Xie & A Minca. *Reinforcement learning for SBM graphon games with resampling*. Submitted to International Conference on Artificial Intelligence and Statistics. Retrieved from https://arxiv.org/abs/2310.16326

[3] H Amini, A Minca & O Peralta. *Ruin-dependent bivariate stochastic fluid processes*. Submitted to Stochastic Systems. Retrieved from https://arxiv.org/abs/2307.16567

[4] H Amini, A Minca & O Peralta. *Duration-dependent stochastic fluid processes and solar energy revenue modeling*. Submitted to Operations Research. Retrieved from https://arxiv.org/abs/2304.06185

[5] J Barr, GT Nguyen & O Peralta. *Wong-Zakai approximation of regime-switching SDEs via rough path theory*. Submitted to Electronic Journal of Probability. Retrieved from https://arxiv.org/abs/2304.10062

[6] H Albrecher & O Peralta. *Space-grid approximations of hybrid stochastic differential equations and first passage properties*. Submitted to Stochastic Systems. Retrieved from https://arxiv.org/abs/2211.01844

[7] GT Nguyen & O Peralta (2022). *Rate of strong convergence to solutions of regime-switching stochastic differential equations*. Submitted to Stochastic Analysis and Applications. Retrieved from https://arxiv.org/abs/2101.03250

In Preparation

[1] J Barr, O Peralta & P Portal. *The splitting theorem for telegraph processes and its Brownian limit*.

[2] T Broadbridge & O Peralta. *Matrix descriptors of the two-island model in population genetics*.

[3] J Tonkin, GT Nguyen & O Peralta. *Pricing barrier options driven by meromorphic Lévy processes*.

[4] A Black, M Fairbrother & O Peralta. *Efficient estimation of epidemic final size probabilities*.

[5] W Allan, GT Nguyen & O Peralta. *Strong solutions and simulation techniques for Lévy-driven hybrid stochastic differential equations with past-dependent switching*.

Theses and dissertations

[1] O Peralta. (2019). *Advances of matrix-analytic methods in risk theory*. Ph.D. Dissertation. Danmarks Tekniske Universitet. Retrieved from https://orbit.dtu.dk/en/publications/advances-of-matrixanalytic-methods-in-risk-modelling

[2] O Peralta. (2015). *Strassen's theorem and erlangization: applications to risk theory*. M.Sc. Dissertation. Universidad Nacional Autónoma de México. Retrieved from http://132.248.9.195/ptd2015/mayo/0730148/Index.html

[3] O Peralta. (2013). *Modelos de reserva con reclamaciones tipo fase y matrix exponencial*. B.Sc. Dissertation. Universidad Nacional Autónoma de México. Retrieved from http://132.248.9.195/ptd2013/abril/0691372/Index.html

Student Supervision

[§] *indicates co-supervision*; [⋆] *indicates Dean's Commendation for Research Excellence*

Ph.D. studies (Australian National University)

2021-current	Jasper Barr[§]	Convergence of regime-switching SDEs via rough path theory

M.Phil. studies (The University of Adelaide)

2021-current	Michael Fairbrother[§]	Diffusion approximations for epidemic modelling and correlated pseudo-marginal inference methods
2020-current	William Abbott[§]	Convergence to Markov-modulated fractional Brownian motion
2021-2023	Jesse Tonkin[§]	Option pricing using Lévy processes observed at Poisson times[⋆]
2021-2023	William Allan[§]	Strong solutions to hybrid SDEs with past-dependent switching[⋆]

Honours studies (The University of Adelaide)

2020-2021	Tayla Broadbridge	Phase-type distributions in population genetics
2019	William Jordan[§]	Analysis of financial indices through extreme value theory

Teaching

Lecturing, tutoring and grading; ‡ indicates M.Sc. course

ITAM	2024	Quantitative Risk Models[‡]
	2024	Mathematical Finance 1
The University of Adelaide	2020	Applied Probability III

Teaching Assistant

Lecturing, tutoring and grading; ‡ indicates M.Sc. course

Danmarks Tekniske Universitet	2016-2017	Stochastic Simulation ‡
	2016	Stochastic Processes ‡
Universidad Nacional Autónoma de México	2015	Stochastic Processes ‡
	2014	Probability ‡
	2014	Applied Probability
	2013-2015	Stochastic Processes
	2013-2014	Stochastic Processes
	2012	Probability 1

Short Academic Stays

08/2022	Københavns Universitet, hosted by Martin Bladt
05/2022	Universidad Nacional Autónoma de México, hosted by Alan Riva-Palacio
05/2021	University of New South Wales, hosted by Eric CK Cheung and JK Woo
12/2019	Universidad Nacional Autónoma de México, hosted by Ramsés Mena
03/2019	Pontificia Universidad Católica de Chile, hosted by Luis Gutiérrez
11/2017 to 04/2018	The University of Adelaide, hosted by Nigel Bean
10/2016	University of Liverpool, hosted by Leonardo Rojas-Nandayapa
01/2015 to 02/2015	University of Queensland, hosted by Leonardo Rojas-Nandayapa

Presentations

† *Indicates Invited talk*

[1] *Homogeneous approximations of time-inhomogeneous semi-Markov life insurance models.*† Probability Seminar - Cornell University, United States, October 2023.

[2] *Homogeneous approximations of time-inhomogeneous semi-Markov life insurance models.*† Actuarial Seminar - University of North Carolina (Charlotte), United States, October 2023.

[3] *Homogeneous approximations of time-inhomogeneous semi-Markov life insurance models.*† Risk Seminar - Instituto Tecnológico Autónomo de México (ITAM), México, May 2023.

[4] *Space-grid approximations of hybrid stochastic differential equations and their ruin probabilities.*† Actuarial Seminar - University of Liverpool, United Kingdom, March 2023.

[5] *Homogeneous approximations of time-inhomogeneous Markov jump processes.*† Mathematics of Risk, Mathematical Research Institute (MATRIX), Australia, November 2022

[6] *Homogeneous approximations of time-inhomogeneous semi-Markov life insurance models.* At the 5th European Actuarial Journal Conference, Estonia, August 2022

[7] *A multivariate risk-theoretic approach to the matrix sequential probability ratio test.* At the 25th International Congress on Insurance: Mathematics and Economics, China, July 2022

[8] *A Markov jump process associated to the matrix-exponential distribution.* At the 11th International Conference on Matrix-Analytic Methods in Stochastic Models, South Korea, July 2022

[9] *Strong approximations of semi-Markov life insurance models.*† At the 73rd Actuarial Seminar of Lyon-Lausanne, Switzerland, June 2022

[10] *Multivariate matrix-exponential affine mixtures and their applications in risk theory.* At the 11th Conference in Actuarial Science & Finance on Samos, Greece, May 2022

[11] *Hybrid stochastic differential equations driven by Lévy processes.*† School of Risk and Actuarial Studies Online Seminar - University of New South Wales, Australia, November 2021.

[12] *Ruin probabilities for risk processes with dependent phase-type claims.* At the Virtual 24th International Congress on Insurance: Mathematics and Economics (IME), July 2021.

[13] *Rate of strong convergence of solutions of regime-switching stochastic differential equations.* At the 64th Annual Meeting of the AustMS, Australia, December 2020.

[14] *Novel applications of continuous-time Markov chains in stochastic and statistical modelling.*† Data Science and Statistics Seminar - The University of Adelaide, Australia, November 2020.

[15] *Phase-type distributions and their application to risk models with dependence.*† Risk Seminar - Instituto Tecnológico Autónomo de México (ITAM), México, October 2020.

[16] *Rate of strong convergence of solutions of regime-switching stochastic differential equations.* At the Bernoulli-IMS One World Symposium, Online Conference, August 2020.

[17] *Rate of strong convergence to Markov modulated Brownian motion.* At the 15th XV Latin American Congress of Probability and Mathematical Statistics (CLAPEM), México, December 2019.

[18] *Flip-flop approximations to the Brownian motion and stochastic differential equations.*† Probability Seminar - Centro de Investigación y de Estudios Avanzados, México, November 2019.

[19] *Flip-flop approximations to the Brownian motion.*† Probability Seminar - Instituto Tecnológico Autónomo de México (ITAM), México, November 2019.

[20] *Rate of strong convergence of stochastic fluid processes to Markov modulated Brownian motion.* At the 20th INFORMS Applied Probability Society Conference, Australia, July 2019.

[21] *Convergence of a bivariate flip–flop process.* At the 20th INFORMS Applied Probability Society Conference, Australia, July 2019.

[22] *An introduction to phase–type distributions.*† Short course at the Workshop in Novel Statistical Methods for Complex Data, Chile, March 2019.

[23] *A fluid process with RAP components.* At the 10th International Conference on Matrix-Analytic Methods in Stochastic Models, Australia, February 2019.

[24] *A fluid process with RAP components.* At the 62nd Annual Meeting of the AustMS, Australia, December 2018.

[25] *On a class of bivariate phase-type distributions and its applications in risk theory.* At the 61st Annual Meeting of the AustMS, Australia, December 2017.

[26] *Parisian ruin for fluid flow risk processes.*† RARE Seminar - University of Liverpool, United Kingdom, October 2016.

[27] *Parisian ruin for fluid flow risk processes.* At the 9th International Conference on Matrix-Analytic Methods in Stochastic Models, Hungary, June 2016.

[28] *The least variable distribution in the class of continuous and discrete phase-type distributions.*† ACEMS Seminar - University of Queensland, Australia, February 2015.

Professional Activities

- Reviewer for Stochastic Processes and their Applications, Journal of Applied Probability, European Journal of Operational Research, Annals of Operations Research, Queueing Systems, and Stochastic Models.
- Member of the organizing committee for INFORMS APS 2019.

Languages

- Spanish (first language), English (fluent in speaking, reading and writing).

Personal references

- Professor Hansjoerg Albrecher
  Department of Actuarial Science, University of Lausanne.
  Email: hansjoerg.albrecher@unil.ch
- Professor Andreea Minca
  School of Operations Research and Information Engineering, Cornell University.
  Email: acm299@cornell.edu

- Associate Professor Eric CK Cheung
  School of Risk and Actuarial Studies, University of New South Wales.
  Email: eric.cheung@unsw.edu.au
- Senior Lecturer Giang T Nguyen
  School of Computer and Mathematical Sciences, The University of Adelaide.
  Email: giang.nguyen@adelaide.edu.au
- Professor Bo Friis Nielsen
  Department of Applied Mathematics and Computer Science, Technical University of Denmark.
  Email: bfni@dtu.dk