

Len Patrick Garces

Curriculum Vitae

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Full Name Len Patrick Dominic M. Garces
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Staff Webpage [UNSW Staff Profile](#)

Education

- 2018–2021 **Doctor of Philosophy**, *University of South Australia*, Adelaide, SA Australia
Thesis: Exchange Options under Stochastic Volatility and Jump-Diffusion (SVJD) Dynamics
Supervisors: Dr Gerald HL Cheang (Principal Supervisor), A/Prof John van der Hoek, A/Prof Anatoli Torokhti
- 2014–2015 **Master of Applied Mathematics, Major in Mathematical Finance**, *Ateneo de Manila University*, Quezon City, Philippines
- 2010–2014 **Bachelor of Science in Applied Mathematics, Major in Mathematical Finance**, *Ateneo de Manila University*, Quezon City, Philippines, *Cum Laude*
- 2010–2014 **Bachelor of Arts, Major in Economics (Honor's Program)**, *Ateneo de Manila University*, Quezon City, Philippines

Employment and Academic Positions

See [Employment History \(Details\)](#) for position descriptions and highlights)

Full-Time Appointments

- Sep 2021–Present **Senior Research Associate**, *University of New South Wales, ARC Centre of Excellence in Population Ageing Research*, Sydney NSW, Australia
- Jan 2021–Aug 2021 **Research Assistant**, *University of South Australia, UniSA STEM*, Adelaide SA, Australia
- Jun 2015–Jun 2018 **Instructor**, *Ateneo de Manila University, Department of Mathematics*, Quezon City, Philippines

Causal/Part-Time Appointments

- Dec 2019–Apr 2021 **Online Tutor**, *University of South Australia, UniSA Online*, Adelaide SA, Australia
- Feb 2019–Dec 2020 **Tutor, Computer Practical Supervisor**, *University of South Australia, UniSA STEM*, Adelaide SA, Australia
- Aug 2015–Dec 2017 **Affiliated Faculty Member**, *Ateneo de Manila University, Department of Economics*, Quezon City, Philippines
- Jun 2014–Mar 2015 **Part-Time Faculty Member**, *Ateneo de Manila University, Department of Mathematics*, Quezon City, Philippines

Research Interests

- Stochastics and Probability Jump-diffusion processes, stochastic volatility, backward stochastic differential equations, stochastic analysis under model uncertainty
- Applications Option pricing, quantitative risk management, term structure modelling, stochastic mortality modelling, actuarial valuation

Methods Time series methods for finance and insurance, particle filters, state-space models, numerical methods for integro-partial differential equations, numerical methods for free boundary problems

Publications

Peer-Reviewed Journal Articles

- (7) LPDM Garces and GHL Cheang (2021), A numerical approach to pricing exchange options under stochastic volatility and jump-diffusion dynamics, *Quantitative Finance*, **21**(12), pp. 2025-2054. [[DOI](#), [arXiv](#)]
- (6) RRP Tan, K Ikeda, and LPDM Garces (2020), On eigenvalue bounds for the finite-state birth-death process intensity matrix, *Journal of Physics: Conference Series*, **1593**. [[DOI](#)]
- (5) GHL Cheang and LPDM Garces (2020), Representation of exchange option prices under stochastic volatility jump-diffusion dynamics, *Quantitative Finance*, **20**(2), pp. 291-310. [[DOI](#), [arXiv](#)]
- (4) DMB Verzosa, MLAN De Las Peñas, MAQ Aberin, LPDM Garces, FF Francisco, EP Bautista, MAC Tolentino, and WC Tabares (2019), Digital simulations for grade 7 to 10 mathematics, *Philippine Journal of Science*, **148**(4), pp. 743-757. [[View at publisher](#)]
- (3) DMB Verzosa, MLAN De Las Peñas, MAQ Aberin, and LPDM Garces (2019), App-based scaffolds for writing two-column proofs, *International Journal of Mathematics Education in Science and Technology*, **50**(5), pp. 776-787. [[DOI](#)]
- (2) DMB Verzosa, MLAN De Las Peñas, MAQ Aberin, and LPDM Garces (2018), App for addition and subtraction of integers, *International Journal for Technology in Mathematics Education*, **25**(4), pp. 21-33.
- (1) R Palanca-Tan, LPDM Garces, ANC Purisima, and ACL Zaratan (2015), Tourism and crime: Evidence from the Philippines, *Southeast Asian Studies*, **4**(3), pp. 565-580. [[DOI](#)]

Peer-Reviewed Conference Papers/Papers in Conference Proceedings

- (2) LPDM Garces, T Bolomolov, and BA Chiera (2021), Regression-based approaches for simulation meta-modelling in the presence of heterogeneity and correlation, In Vervoort RW, Voinov AA, Evans JP, Marshall L (eds) *MODSIM2021, 24th International Congress on Modelling and Simulation*. Modelling and Simulation Society of Australia and New Zealand, December 2021, pp. 827-833. ISBN: 978-0-9872143-8-6. [[DOI](#)]
- (1) LPDM Garces and MER Reserva (2015), Estimating Philippine Dealing System Treasury (PDST) reference rate yield curves using a state-space representation of the Nelson-Siegel model, In Lee KL, Mansor KA, Nayan A, Zakaria SF, Idrus Z (eds) *Quest for Research Excellence on Computing, Mathematics and Statistics: Chapters in Book, 2nd International Conference on Computing, Mathematics and Statistics 2015 (iCMS 2015)*. Faculty of Computer & Mathematical Sciences, UiTM Kedah, November 2015, p. 213-223. ISBN: 978-967-0314-26-6

Working Papers

- (1) LPDM Garces and GHL Cheang (2020), A put-call transformation of the exchange option problem under stochastic volatility and jump-diffusion dynamics. [[arXiv](#)]

Textbooks

- (1) CPO Chan Shio, JC Briones, LPDM Garces and JCF Mallari (2017), *Business Mathematics for Filipinos*, Phoenix Publishing House, Inc.

Presentations at Conferences, Seminars, and Workshops

Conferences: Contributed Talks

- 2021 Regression-based approaches for simulation meta-modelling in the presence of heterogeneity and correlation, *24th International Congress on Modelling and Simulation (MODSIM 2021)*, Sydney, Australia (and Online), 8 December 2021
A numerical approach to pricing exchange options under stochastic volatility and jump-diffusion dynamics, *10th General Advanced Mathematical Methods for Finance (AMaMeF) Conference*, Online, 25 June 2021
- 2020 Put-call transformation of the exchange option problem under stochastic volatility and jump-diffusion dynamics, *Bernoulli-IMS One World Symposium 2020*, Online, 24 to 28 August 2020
- 2019 Exchange option pricing under stochastic volatility and jump-diffusion dynamics, *Quantitative Methods in Finance 2019 Conference*, Sydney, Australia, 19 December 2019
- 2018 Eigenvalue bounds for the finite-state birth-death process intensity matrix, *2018 Mathematical Society of the Philippines Annual Convention*, Clark Freeport Zone, Pampanga, Philippines, 17 May 2018
- 2016 Calculator-aided instruction in calculus and financial mathematics (sponsored by Sharp Calculators - Philippines), *2018 Mathematical Society of the Philippines Annual Convention*, Cebu City, Philippines, 30 May 2016
- 2015 Estimating Philippine Dealing System Treasury reference rate yield curves using a state-space representation of the Nelson-Siegel model, *The 2nd International Conference on Computing, Mathematics and Statistics (iCMS 2015)*, Langkawi Island, Malaysia, 4 November 2015

Conferences: Poster Presentations

- 2018 Developing competency in two-column proof-writing via interactive software applications, *2018 Mathematical Society of the Philippines Annual Convention*, Clark Freeport Zone, Pampanga, Philippines, 17 to 19 May 2018
- 2017 Interactive mobile applications for teaching and learning mathematics, *2017 Mathematical Society of the Philippines Annual Convention*, Legazpi City, Philippines, 29 to 31 May 2017

Presentations at Seminars, Workshops, and Other Events

- 2019 Exchange option pricing under stochastic volatility and jump-diffusion dynamics, *Centre for Industrial and Applied Mathematics (CIAM) Seminar*, University of South Australia, Adelaide SA, Australia 6 December 2019
- 2014 Hermite-Hadamard-type inequalities for convex-on-the-coordinates functions of two and three variables, *School of Science and Engineering Awards for Outstanding Student Research*, Ateneo de Manila University, Quezon City, Philippines, March 2014

Participation at Conferences, Seminars, Workshops and Other Activities

(Participation/attendance in a non-presenter role)

- 2021 29th Colloquium on Pensions and Retirement Research, ARC CEPAR and School of Risk and Actuarial Studies, UNSW Sydney, 1 to 3 December 2021
Served as Session Chair for parallel sessions on (1) Health and Longevity and (2) Annuities
AMSI Summer School 2021, Australian Mathematical Sciences Institute and University of Adelaide, January to February 2021
Course Taken: The Mathematical Engineering of Deep Learning (non-credit)
- 2020 Industry Mentoring Network in STEM (IMNIS), Australian Academy of Technology and Engineering, June 2020 to July 2021
Participant/Mentee

Research Grants

(Successful grant applications as co-proponent/investigator)

- 2019 **Department of Science and Technology - Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD)**, *Technology Innovations for Mathematical Thinking, Statistical Reasoning, and Assessment*, July 2019 to December 2021, Php 4,940,910.00
with Prof MLAN De Las Peñas (Lead Investigator), MAQ Aberin, ML Loyola, A/Prof JF Sarmiento, MAC Tolentino, DMB Verzosa
- 2017 **Commission on Higher Education (CHED) - Discovery-Applied Research and Extension for Trans/Inter-Disciplinary Opportunities (DARE TO) Grant-in-Aid**, *A model template for city- and municipality-wide public school feeding programs for national implementation*, January 2017 to January 2020, Php 14,555,056.00
with A/Prof EP Miro (Lead Investigator), LA Lopez, JCF Mallari, JT Sescon, A Yap, AR Zosa
- 2016 **University Research Council, Ateneo de Manila University**, *Evaluation of the Results of the ACED Blueplate for Better Learning Feeding Program*, August 2016 to May 2017, Php 500,000.00
with A/Prof EP Miro (Lead Investigator), LA Lopez, JCF Mallari, JLL Martin, MRPS Onglao, JT Sescon, AR Zosa
- 2015 **Department of Science and Technology - Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD)**, *Development of Interactive Software and Teaching Guides for Grade 7 to 10 Mathematics*, April 2015 to January 2018, Php 2,862,912.00
with Prof MLAN De Las Peñas (Lead Investigator), MAQ Aberin, EP Bautista, FF Francisco, MAC Tolentino, WC Tabares, DMB Verzosa

Consultancy Projects

- 2016 **Development Bank of the Philippines[†]**, November 2016 to May 2017
with AR Zosa
- 2016 **Rizal Commercial Banking Corporation[†]**, January 2016 to June 2016
with Prof EP de Lara-Tuprio
- 2016 **Department of Education (DepEd), Republic of the Philippines**, *Learner's Material (LM) for General Mathematics of the Senior High School K-12 Core Curriculum*, January 2016 to June 2016
- 2015 **Rizal Commercial Banking Corporation[†]**, August 2015 to December 2015
with Prof EP de Lara-Tuprio, JRC Briones, JCF Mallari
- 2014 **Land Bank of the Philippines[†]**, November 2014 to March 2015
with RCT Villanueva and Z Zhang

[†]Project title is classified; projects are mostly on the validation of credit risk models, statistical credit scorecard models, market risk models, and operational risk models and are commissioned for compliance with regulatory requirements.

Awards and Distinctions

- 2018-2021 UniSA International HDR Scholarship and the Research Training Program International (RTPi) Stipend
University of South Australia
- 2020 Ateneo Research Institute of Science and Technology Publication Awards
Ateneo de Manila University
- 2020 IMS Hannan Graduate Student Travel Award
Institute of Mathematical Statistics
- 2018-2021, 2015 Loyola Schools Scholarly Publication Awards
Ateneo de Manila University
- 2018 Loyola Schools Faculty Development Grant for Graduate Studies Abroad
Ateneo de Manila University
- 2017 Honorable Mention (Poster Presentation)
2017 Annual Convention of the Mathematical Society of the Philippines
- 2014 Top 5, Bloomberg Aptitude Test (Asia-Pacific Region), March 2014

Co-Organization of Conferences, Workshops, and Other Events

- May 2021 **2021 Mathematical Society of the Philippines Annual Convention**, *Master of Ceremonies*, Mathematical Society of the Philippines
- Jun 2018 **Philippine Science High School - Southern Mindanao Campus Student Internship**, *Intern Research Supervisor and Organizing Committee Member*, Ateneo de Manila University
- Sep 2017-Mar 2018 **Tuklas Matematika Online**, *Contributor*, Ateneo de Manila University
- Aug 2017-Jan 2018 **20th Philippine Mathematical Olympiad (PMO)**, *National Stage Coordinator*, Mathematical Society of the Philippines
- Apr 2017-May 2017 **Workshop on Modern Trends in Mathematical Crystallography (MathCryst Manila 2017)**, *Local Organizing Committee Member*, International Union of Crystallography and Ateneo de Manila University
- Jun 2016-Jan 2017 **19th Philippine Mathematical Olympiad (PMO)**, *Regional Coordinator - National Capital Region*, Mathematical Society of the Philippines
- Sep 2016-Nov 2016 **Program of Excellence in Mathematics**, *Facilitator and Organizing Committee Member*, Ateneo de Manila University
- Oct 2016 **Summer School on Applied Mathematics and Scientific Computing**, *Local Organizing Committee Member*, IWR, Heidelberg University and Ateneo de Manila University
- Jan 2016 **Symposium on Graph Theory and Applications**, *Local Organizing Committee Member*, Ateneo de Manila University
- Sep 2015-Oct 2015 **Program of Excellence in Mathematics**, *Facilitator and Organizing Committee Member*, Ateneo de Manila University
- Apr 2015 **National Training of Trainers for Grade 10 Mathematics (K-12 Basic Education Curriculum)**, *Organizing Committee Member*, Department of Education, Republic of the Philippines

Nov 2014–Dec 2014 **Program of Excellence in Mathematics**, *Facilitator and Organizing Committee Member*, Ateneo de Manila University

Languages

Filipino Mother tongue

English Proficient

IELTS Overall Score: 8.5 (16 Aug 2021); CEFR Level C2

Computer skills

Computing MATLAB, Python, R

Typesetting \LaTeX

Employment History (Details)

Full-Time Appointments

- Sep 2021–Present **Senior Research Associate**, *University of New South Wales, ARC Centre of Excellence in Population Ageing Research*, Sydney NSW, Australia
Investigating continuous-time mortality models, designing estimation procedures for mortality models, and exploring applications in actuarial valuation. Also co-coordinating the CEPAR Stream 4: [Sustainable Wellbeing in Later Life](#) led by Prof Michael Sherris.
- Jan 2021–Aug 2021 **Research Assistant**, *University of South Australia, UniSA STEM*, Adelaide SA, Australia
Investigated and implemented (using R) regression-based statistical methods for simulation meta-modelling. Was done as part of a Defense Science Partnership (DSP) Agreement with the Commonwealth of Australia, represented by the Defence Science and Technology Group (DSTG) - Operations Research Network.
- Jun 2015–Jun 2018 **Instructor**, *Ateneo de Manila University, Department of Mathematics*, Quezon City, Philippines
Prepared and delivered lectures, assessments, and other course materials for several undergraduate mathematics courses and graduate financial mathematics courses (see [Courses Taught](#)). Supervised various students in their undergraduate thesis or final master's projects (see [Student Supervision](#)) and sat as a panelist in the examination of students' undergraduate thesis (see [Thesis Examination](#)). Participated in various research projects and university functions and served as an organizer of several departmental outreach activities.

Causal/Part-Time Appointments

- Dec 2019–Apr 2021 **Online Tutor**, *University of South Australia, UniSA Online*, Adelaide SA, Australia
Provided instructional support (including student consultations and marking) in several courses (see [Courses Taught](#)) in the online Data Analytics undergraduate program under UniSA Online.
- Feb 2019–Dec 2020 **Tutor, Computer Practical Supervisor**, *University of South Australia, UniSA STEM*, Adelaide SA, Australia
Facilitated weekly tutorial/exercise and computer practical classes for several undergraduate mathematics and statistics courses (see [Courses Taught](#)). Marked student assessments and examinations.
- Aug 2015–Dec 2017 **Affiliated Faculty Member**, *Ateneo de Manila University, Department of Economics*, Quezon City, Philippines
Prepared and delivered lectures, assessments, and other course materials for several undergraduate economics courses (see [Courses Taught](#)). Designed and delivered a course on introductory time series and generalized linear models as a pilot for a second course on econometrics which was incorporated in the 2018 revision of the university's Economics curriculum. Sat as a panelist for several undergraduate theses for the Economics and Development Studies programs (see [Thesis Examination](#)).
- Jun 2014–Mar 2015 **Part-Time Faculty Member**, *Ateneo de Manila University, Department of Mathematics*, Quezon City, Philippines
Prepared and delivered lectures, assessments, and other course materials for several freshman mathematics courses (see [Courses Taught](#))

Teaching Experience and Student Supervision (Details)

Courses Taught

(By term course was last taught)

University of South Australia (2019–2021)

- INFS 3081 UO Predictive Analytics (Online Tutorials)
2021 SP1
- MATH 2032 UO Statistics using R (Assessment Writing, Online Tutorials)
2021 SP1, 2020 SP4, 2020 SP1

- INFS 3080 UO Data Visualization (Online Tutorials)
2020 SP6
- INFS 2036 Business Intelligence (Tutorials)
2020 SP5, 2020 SP2, 2019 SP5
- MATH 1064 Mathematical Methods for Engineers 2 (Marking)
2020 SP5
- MATH 1063 Mathematical Methods for Engineers 1 (Tutorials and Computer Practicals)
2020 SP2, 2019 SP5, 2019 SP2
- MATH 1068 Statistical Methods (Tutorials and Computer Practicals)
2020 SP2
- MATH 1053 Quantitative Methods for Business (Tutorials and Computer Practicals)
2019 SP5, 2019 SP2
- MATH 1054 Calculus 1 (Tutorials)
2019 SP2

Ateneo de Manila University (2014–2018)

Graduate Courses

- AMF 270 Introduction to Options
SY 2018-2019 Summer, SY 2017-2018 Summer
- MA 295L.7 Seminar: Financial Derivatives
SY 2017-2018 Semester 2, SY 2016-2017 Semester 2
- MA 295S.4 Seminar: Statistical Methods
SY 2017-2018 Semester 1, SY 2016-2017 Semester 1
- AMF 271 Financial Derivatives
SY 2017-2018 Semester 1
- MATH 295L.4 Seminar: Introduction to Finance and Economics
SY 2015-2016 Semester 2
- AMF 272 Risk Management
SY 2015-2016 Semester 2

Undergraduate Courses (Mathematics)

- MA 22 Mathematical Analysis II
SY 2017-2018 Semester 2, SY 2016-2017 Semester 2, SY 2016-2017 Semester 1
- MA 195L.2 Seminar: Introduction to Financial Mathematics II
SY 2017-2018 Semester 2, SY 2016-2017 Semester 2
- MA 151 Elementary Probability Theory
SY 2017-2018 Summer, SY 2016-2017 Summer
- MA 21 Mathematical Analysis I
SY 2015-2016 Semester 2
- MA 12 Modern Mathematics II
SY 2015-2016 Semester 2, SY 2015-2016 Summer
- MA 18A/B Principles of Modern Mathematics I/II
SY 2015-2016 Semester 1, SY 2014-2015 Semester 1
- MA 1 Introduction to College Algebra
SY 2015-2016 Semester 1, SY 2014-2015 Semester 1
- MA 20 Calculus for Economists
SY 2014-2015 Semester 2

Undergraduate Courses (Economics)

- EC 117 Introduction to Econometrics
SY 2017-2018 Semester 1
- EC 115 Introduction to Mathematical Economics
SY 2016-2017 Semester 2, SY 2015-2016 Semester 2
- EC 187.67 Special Topics in Economics: Time Series Analysis and General Linear Models
SY 2016-2017 Semester 1
- EC 111 Intermediate Microeconomic Theory
SY 2016-2017 Semester 1, SY 2016-2017 Summer
- EC 116 Statistics for Economists
SY 2015-2016 Semester 1

Student Supervision (Bachelor's and Master's Thesis/Projects)

- Dec 2021–Feb 2022 **Jovana Kolar**, *CEPAR Summer Scholarship*, ARC Centre of Excellence in Population Ageing Research (CEPAR), UNSW Sydney
Modelling systematic mortality risk with affine models (co-supervised with Prof. Michael Sherris)
- Jun 2017–May 2018 **Renzo Roel P. Tan**, *BSc Mathematics*, Undergraduate Thesis, Ateneo de Manila University
On Eigenvalue Bounds for the Finite-State Birth-Death Process Intensity Matrix
- Aug 2017–May 2018 **Mikaela Rei Africa**, **Anna Maria Avila**, **Marc Louie Magallanes**, *MApplMath Mathematical Finance*, Mathematical Finance Project, Ateneo de Manila University
On the Optimization of the Infusion of Funds in a Fixed-Income Portfolio: A Credit Risk Perspective
- Aug 2017–May 2018 **Eduard De Guzman**, **Pia Angeli Espartinez**, **Joel Mediana Jr.**, *MApplMath Mathematical Finance*, Mathematical Finance Project, Ateneo de Manila University
Network Analysis of High-Yield, High-Value Export Crops in Mindanao
- Aug 2017–May 2018 **Aaron Jan Cayanan**, **Jasmine Dela Cruz**, **Jimmy Soriano**, *MApplMath Mathematical Finance*, Mathematical Finance Project, Ateneo de Manila University
Credit Scorecard Development for Salary Loans

Thesis Examination

- 2018 **Kyle Mitschiener**, *BSc Mathematics*, Undergraduate Thesis, Ateneo de Manila University
Multivariate Extensions of the Moment Generating Function Order and an Introduction of a New Life Class
- Immanuel Gabriel Sin**, *BSc Mathematics*, Undergraduate Thesis, Ateneo de Manila University
The Probability that a Matrix of Integers is Diagonalizable
- 2017 **Ephreim Josh Pangilinan**, *BSc Mathematics*, Undergraduate Thesis, Ateneo de Manila University
Hyperreal Numbers and Extension of the p -adic Numbers
- Trixie Tuparan**, *BSc Mathematics*, Undergraduate Thesis, Ateneo de Manila University
Archimedes' $\frac{2}{3}$ -Property on Areas of Parabolic Segments
- Jurel Yap**, *AB Development Studies*, Undergraduate Thesis, Ateneo de Manila University
An Afterschool Play-Learning and Manipulatives Based Math Enrichment Program for Grade 3 Public School Students of the Philippine Toy Library
- Nicholas Timothy Ang and Kaye Janelle Yao**, *AB Economics*, Undergraduate Thesis, Ateneo de Manila University
Government Size and the Implications on Perceived Levels of Corruption in the Philippines

- 2016 **Aldrin Advincula and Roake Madrinan**, *AB Economics*, Undergraduate Thesis, Ateneo de Manila University
An Examination of the Wage-Labor Productivity Gap: An Empirical Analysis in the Philippines
- Paolo Magnata**, *AB Development Studies*, Undergraduate Thesis, Ateneo de Manila University
Choosing the Green Energy Option: A Willingness-to-Pay Study of Metro Manila Residents for Renewable Energy