Dr. Gechun LIANG

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Education

- 2011, D.Phil. (Ph.D.) Mathematics, University of Oxford.

Employment

- August 2021-present, Reader, Department of Statistics, University of Warwick.
- September 2017-July 2021, Associate Professor, Department of Statistics, University of Warwick.
- July–September 2019, External Senior Fellow and Marie S. Curie FCFP Fellow, Freiburg Institute for Advanced Studies, University of Freiburg.
- June 2013–August 2017, Lecturer, Department of Mathematics, King's College London (tenured since April 2016).
- November 2010–June 2013, Postdoctoral Research Fellow, Oxford-Man Institute, University of Oxford.

Fields of Specialization

Mathematical Finance and Stochastic Analysis. Topics include (1) stochastic control and backward stochastic differential equations; (2) optimal stopping and free boundary problems; (3) viscosity solutions and numerics; (4) optimal investment and forward preferences; (5) funding liquidity risk and credit risks.

Publications

Journal Articles

- **A game theoretical approach to homothetic robust forward investment performance processes in stochastic factor models**, (with Juan Li and Wenqiang Li), *SIAM Journal on Financial Mathematics*, Vol.12, No.2, (2021), 867—897.
- **Analysis of the optimal exercise boundary of American put option with delivery lags**, (with Zhou Yang), *Journal of Mathematical Analysis and Applications*, Vol.497, No.2, (2021), 1–21.
- **Pricing vulnerable options in a hybrid credit risk model driven by Heston-Nandi GARCH processes**, (with Xingchun Wang), *Review of Derivatives Research*, Vol.24, No.1, (2021), 1–30.
- **Systems of ergodic BSDE arising in regime switching forward performance processes**, (with Ying Hu and Shanjian Tang), *SIAM Journal on Control and Optimization*, Vol.58, No.4, (2020), 2503-2534.
- **An approximation scheme for semilinear parabolic PDEs with convex and quadratic growth Hamiltonians**, (with Shuo Huang and Thaleia Zariphopoulou), *SIAM Journal on Control and Optimization*, Vol.58, No.1, (2020), 165–191.
- **Dynkin games with Poisson random intervention times**, (with Haodong Sun), *SIAM Journal on Control and Optimization*, Vol.57, No. 4, (2019), 2962–2991.

- **An ergodic BSDE approach to forward entropic risk measures: representation and large-maturity behavior** (with Alfred Chong, Ying Hu and Thaleia Zariphopoulou), *Finance and Stochastics*, Vol.23, No.1, (2019), 239–273.
- **Constrained portfolio-consumption strategies with uncertain parameters and borrowing costs** (with Zhou Yang and Chao Zhou), *Mathematics and Financial Economics*, Vol.13, No.3, (2019), 393–427.
- **Representation of homothetic forward performance processes in stochastic factor models via ergodic and infinite horizon BSDE** (with Thaleia Zariphopoulou), *SIAM Journal on Financial Mathematics*, Vol.8, No.1, (2017), 344–372.
- **A multidimensional exponential utility indifference pricing model with applications to counterparty risk** (with Vicky Henderson), *SIAM Journal on Control and Optimization*, Vol.54, No.2, (2016), 690–717.
- **Optimal switching at Poisson random intervention times** (with Wei Wei), *Discrete and Continuous Dynamical Systems-Series B*, Vol.21, No.5, (2016), 1483–1505.
- **Stochastic control representations for penalized backward stochastic differential equations**, *SIAM Journal on Control and Optimization*, Vol.53, No.3, (2015), 1440–1463.
- **Funding liquidity, debt tenor structure, and creditor's belief: An exogenous dynamic debt run model** (with Eva Lütkebohmert and Wei Wei), *Mathematics and Financial Economics*, Vol.9, No.4, (2015), 271–302.
- **Dynkin game of convertible bonds and their optimal strategy** (with Huiwen Yan, Zhou Yang and Fahuai Yi), *Journal of Mathematical Analysis and Applications*, Vol.426, No.1, (2015), 64–88.
- **Indifference pricing and hedging in a multiple-priors model with trading constraints** (with Huiwen Yan and Zhou Yang), *Science China Mathematics*, Vol.58, No.4, (2015), 689–714.
- **Fully coupled forward-backward stochastic dynamics and functional differential systems** (with Matteo Casserini), *Stochastics and Dynamics*, Vol.15, No.2, (2015), 1–25.
- **Pseudo linear pricing rule for utility indifference valuation** (with Vicky Henderson), *Finance and Stochastics*, Vol.18, No.3, (2014), 593–615.
- **A multi-period bank-run model for liquidity risk** (with Eva Lütkebohmert and Yajun Xiao), *Review of Finance*, Vol.18, No.2, (2014), 803–842.
- **A modified structural model for credit risk** (with Lishang Jiang), *IMA Journal of Management Mathematics*, Vol.23, No.2, (2012), 147–170.
- **The backward stochastic dynamics on a filtered probability space** (with Terry Lyons and Zhongmin Qian), *Annals of Probability*, Vol.39, No.4, (2011), 1422–1448.
- **The valuation of the basket CDSs in a primary-subsidiary model** (with Jianwei Lin, Sen Wu and Harry Zheng), *Asia-Pacific Journal of Operational Research*, Vol.28, No.2, (2011), 213–238.
- **The credit risk and pricing of OTC options** (with Xuemin Ren), *Asia-Pacific Financial Markets*, Vol.14, No.1, (2007), 45–68.

Proceedings and other Publications

- **A functional approach to backward stochastic dynamics**, *DPhil thesis, University of Oxford*, (2011).
- **Quantification of liquidity risk in a two-period model** (with Eva Lütkebohmert and Yajun Xiao), *Proceeding of Actuarial and Financial Mathematical Conference: Interplay between Finance and Insurance, Editors: M. Vanmaele et al*, (2011), 51–60.
- **Application of Copula theory in credit risk** (with Xuemin Ren), *Chinese Journal of Applied Probability and Statistics*, Vol.27, No.4, (2011), 369–379.

Working Papers

- **A monotone scheme for nonlinear partial integro-differential equations with the convergence rate of alpha-stable limit theorem under sublinear expectation**, (with Mingshang Hu and Lianzi Jiang), *arXiv:2107.11076.*
- **Quantitative stability and numerical analysis of Markovian quadratic BSDEs with reflection**, (with Dingqian Sun and Shanjian Tang), *arXiv:2010.05707*.
- **Ergodic singular stochastic control motivated by the optimal sustainable exploitation of an ecosystem**, (with Mihail Zervos), *arXiv:2008.05576*.
- **Risk-sensitive Dynkin games with heterogeneous Poisson random intervention times**, (with Haodong Sun), *arXiv:2008.01787*.
- **A monotone scheme for G-equations with application to the convergence rate of robust central limit theorem**, (with Shuo Huang), *arXiv:1904.07184*.
- **Optimal investment and consumption with forward preferences and uncertain parameters**, (with Alfred Chong), *arXiv:1807.01186*.
- **Exponential utility maximization and indifference valuation with unbounded payoffs** (with Ying Hu and Shanjian Tang), *arXiv:1707.00199*.
- **A functional approach to FBSDEs and its application in optimal portfolios** (with Terry Lyons and Zhongmin Qian), *arXiv:1011.4499*.

Teaching

- Lecturer at University of Warwick for the following courses:

  • *Stochastic Methods in Finance* (4th year module, 20+ students, 2020).

  • *Dynamic Stochastic Control* (4th year module, 10+ students, 2018/19).

  • *Systemic Risk and Contagion Risk* (an optional module for MSc Financial Mathematics, 10+ students, 2018/19).

  • *Actuarial Methods* (3rd year module, 50+ students, 2017/18/19).
- Lecturer at King's College London for the following courses:

  • *Markov Chains* (3rd year module, 80+ students, 2013/14/15/16).
  • *Interest Rates and Foreign Exchange Dynamics* (a compulsory module for MSc Financial Mathematics, 90+ students, 2014/15/16).
  • *Interest Rates and Credit Risk* (a compulsory module for MSc Financial Mathematics, 90+ students, 2017).
  • *Mathematical Analysis for Financial Mathematics* (a foundation course for MSc Financial Mathematics, 90+ students, 2016).
- Lecturer at King's College-UNAM Winter School in Financial Mathematics, UNAM, Mexico:

  • *Backward Stochastic Differential Equations and Their Applications in Financial Mathematics* (50+ students, 2017).
- Lecturer at Summer School in Financial Mathematics, Shandong University for the following courses:

  • *Mathematics of Optimal Investment* (60+ students, 2017).

  • *Interest Rates Theory* (90+ students, 2015).
- Tutor and Teaching Assistant at University of Oxford for the following courses: *Stochastic Differential Equations*, *Applied Partial Differential Equations*, *Mathematical Models of Financial Derivatives*, *Financial Derivatives II*, etc.

Research Supervision

PhD students.

- Zhenda Xu, University of Warwick, 2020-2021. (visiting PhD from Shandong University)
- Yuwei Wang, University of Warwick, 2020-present. (joint with Moris Strub, Southern University of Science and Technology)
- Osian Shelley, University of Warwick, 2019-present. (joint with Martin Hendergen)
- Haodong Sun, University of Warwick, 2016-2020. (first job: Credit Suisse)
- Shuo Huang, University of Warwick, 2016-2020. (first job: PIMCO)
- Dingqian Sun, University of Warwick, 2018-2019. (visiting PhD from Fudan University)
- Yuan Wang, University of Warwick, 2017-2018. (visiting PhD from Shandong University/)
- Alfred Chong, King's College London, 2015-2017. (first job: Assistant Professor at University of Illinois at Urbana-Champaign).

PhD examination board

- Nikita Merkulov, 2021, University of Leeds
- Mattew Zeng, 2019, University of Warwick

Professional Activities

- EPSRC peer review college member and panel member, since 2016.
- Director and admissions tutor for *MSc Statistics, University of Warwick*, 2017-2019.
- Admissions tutor and project coordinator for *MSc Financial Mathematics, King's College London*, 2014-2016.
- Coordinator (with Alex Mijatovic) of the center *London Probability at King's*, 2016-2017.
- Organizer (with Eva Lutkebohmert and Yajun Xiao) of *the Conference on Systemic Risk and Financial Stability*, 19-20 September, 2019.
- Co-organizer of *the Fudan-Warwick Spring School on Financial Mathematics and Stochastic Analysis*, 15-30 April, 2019.
- Organizer of *the Fudan-Warwick Workshop on Financial Mathematics and Stochastic Analysis*, 1-2 November, 2018 and 30-31 July 2019.
- Organizer (with Yiqing Lin) of *the Workshop on Stochastic Optimal Control and its Applications*, 26-27 July, 2018.
- Scientific committee of *the Fourth Young Researchers Meeting on BSDEs, Nonlinear Expectations and Mathematical Finance*, 23-27 April, 2018.
- Organizer (with with Alex Mijatovic) of the workshop *New Directions in Ergodic Stochastic Controls and its Applications*, 20 January, 2017.
- Session organizer of *INFORMS Annual Meeting 2013*, Minneapolis, 6-9 October, 2013.
- Organizer (with Sam Cohen and Arnaud Lionnet) of *Young Researchers' Meeting on BSDEs, Numerics and Finance*, Oxford-Man Institute, University of Oxford, 2-4 July, 2012.
- Organizer of *Stochastic Finance Seminar*, University of Warwick, 2018-2019, 2020-2021.
- Co-organizer of *London Probability Seminar Series*, 2016-2017.
- Co-organizer of *London Mathematical Finance Seminar Series*, 2014-2017.
- Organizer (with Sam Cohen) of *Backward Stochastic Differential Equations and Their Applications in Finance Seminar*, Oxford-Man Institute, University of Oxford, Hilary term and Trinity term 2011.

- Referee for various journals, including *Chinese Annals of Mathematics*(1), *Communications in Statistics-Theory and Methods*(1), *Discrete and Continuous Dynamical Systems-Series B*(1), *Electronic Journal of Probability*(1), *Finance and Stochastics*(7), *IMA Journal of Applied Mathematics*(1), *IMA Journal of Mathematical Control and Information*(1), *International Journal of Theoretical and Applied Finance*(1), *Journal of Computational Finance*(1), *Journal of Differential Equations*(4), *Journal of Economic Dynamics and Control*(4), *Journal of Optimization Theory and Applications*(1), *Mathematical Finance*(2), *Mathematical Methods in the Applied Sciences*(1), *Mathematics and Financial Economics*(4), *Mathematics of Operational Research*(5), *Probability Theory and Related Fields*(1), *Probability, Uncertainty and Quantitative Risk*(3), *Quantitative Finance*(1), *SIAM Journal on Control and Optimization*(8), *SIAM Journal on Financial Mathematics*(6), *Stochastic Analysis and Applications* (2), *Stochastic Processes and Their Applications*(5), *Stochastics*(1) etc.

Honors, Awards and Funding

- International Visiting Fellowship, Warwick Institute of Advanced Studies, PI, with Alfred Chong as CoI, 2019-2020.
- Senior Fellowship at FRIAS, Freiburg Institute for Advanced Studies, University of Freiburg, 2018-2019.
- Rutherford Strategic International Fellowship, Warwick Institute of Advanced Studies, PI, with Yiqing Lin as CoI, 2018.
- Royal Society International Exchanges Grant (Ref: 170137), PI, with Shanjian Tang as CoI, 2018-2020.
- LMS Grant Scheme 4: Research in Pairs (Ref: 41723), PI, 2018.
- LMS Grant Scheme 4: Research in Pairs (Ref: 41920), PI, 2020.
- Excellent module for "Actuarial Methods" at University of Warwick, 2017/2018.
- Nominated in the Teaching Excellence Awards at King's College London, 2017.
- Fellow of the Higher Education Academy (Ref:PR099827), since 2016.
- Nominated as the best MSc project supervisor at King's College London, 2015.
- King's Worldwide Partnership Fund, PI, 2015.
- Funding from St John's College Research Center and Oxford-Man Institute to organize a young researchers' meeting on BSDEs, Numerics and Finance, 2012.
- Associate member of the Oxford-Man Institute of Quantitative Finance, 2013-present.
- Oxford-Man Institute of Quantitative Finance Research Fellowship, 2010–2013.
- St Anne's College Non-stipendiary Research Fellowship, 2010–2013.
- Travel fund from the European Summer School in Financial Mathematics, 2008/2009.
- Oxford-Man Institute of Quantitative Finance Student Scholarship, 2007–2010.

Academic Visiting

- Freiburg Institute of Advanced Studies (FRIAS), University of Freiburg, July-September 2019. (FRIAS Senior Fellow and Marie Curie Fellow)
- School of Mathematical Sciences, Fudan University, April 2018, April 2019. (Visiting Shanjian Tang)
- Institute of Mathematics, UNAM, Mexico, January 2017. (Delivering a winter school course)
- IRMAR, University of Rennes 1, France, September 2016, June and September 2017, June and September 2018. (Visiting Ying Hu)
- School of Mathematical Sciences, Shandong University (Weihai campus), July 2015, July 2017. (Delivering two summer school courses)

- School of Mathematical Sciences, South China Normal University, September 2014, June 2015, May 2017, July 2018. (Visiting Zhou Yang)
- The Hausdorff Research Institute for Mathematics, University of Bonn, August 2013. (Hausdorff Trimester Program: Stochastic Dynamics in Economics and Finance)
- Department of Mathematics, University of Texas at Austin, April 2012, November 2016. (Visiting Thaleia Zariphopoulou)
- Department of Mathematics, National University of Singapore, September 2011, January 2013. (Visiting Min Dai)
- Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong, September 2011. (Visiting Nan Chen)
- Department of Mathematical Finance, University of Freiburg, December 2009, March 2010, December 2010, March 2012, April 2014, October 2014. (Visiting Eva Lütkebohmert)

Invited Presentations

• Workshop on Stochastic Games with Partial and Asymmetric Information, The Collegio Carlo Alberto, 6 July, 2021.
• LMM-Laboratoire Manceau de Mathematiques, Le Mans Universite, 20 April, 2021.
• School of Mathematics, University of Leeds, 4 February 2021.
• International Online Workshop on Financial Mathematics & Financial Engineering & Insurance Actuary CSIAM 2020, 12 December, 2020.
• Osaka Webinar on Mathematical Finance, 12 November, 2020.
• The 7th Workshop on Mathematical Finance and Related Issues, Osaka University Nakanoshima Center, 10 March 2020.
• Probability Seminar at King's, King's College London, 10 February, 2020.
• Mathematical Finance and Stochastic Analysis Seminars, York University, 14 October, 2019.
• Workshop on Probability, Uncertainty, and Quantitative Risk (PUQR), Shandong University, 13 July, 2019.
• 2019 IMS International Conference on Statistics and Probability, 7 July, 2019.
• School of Mathematical Sciences, Tongji University, 15 and 29 April 2019
• Mathematics School, Jilin University, Changchun, 9 April, 2019.
• Workshop on BSDEs, Information and MCKEAN-VLASOV Equations, University of Leeds, 10 September, 2018.
• School of Mathematical Science, South China Normal University, 19 July, 2018.
• Mathematics School, Jilin University, Changchun, 16 July, 2018.
• The 5th Workshop on Control Theory (in memory of Xunjing Li), 13 July, 2018.
• The 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Taipei, 6 July, 2018.
• The 40th Conference on Stochastic Processes and their Applications, Gothenburg, Sweden, 14 June, 2018.
• School of Mathematical Sciences, Fudan University, 18 April 2018
• School of Mathematical Sciences, Shanghai Jiao Tong University, 17 April 2018
• School of Mathematical Sciences, Tongji University, 16 April 2018
• Mathematics School, Jilin University, Changchun, 12 April 2018.
• Economics School, Jilin University, Changchun, 8 April 2018.
• School of Mathematics, University of Leeds, 1 February 2018.
• Stochastic Analysis Seminar, University of Oxford, 27 November 2017.
• School of Mathematical Sciences, Fudan University, Shanghai, 17 July 2017.
• International Workshop on BSDEs, SPDEs and their Applications, Edinburgh University, 6 July 2017.
• IRMAR, University of Rennes 1, France, 12 June 2017.
• East Midland Stochastic Analysis Seminars, University of Oxford, 15 March 2017.
• Job interview presentation at University of Warwick, 31 January 2017.
• SIAM Conference on Financial Mathematics & Engineering, Austin, 19 November 2016.

• School of Mathematical Sciences, Peking University, 15 April 2016.
• 2016 International Conference on Financial Engineering and Innovation, Shenzhen, 9 April 2016.
• Mathematical Department, Tongji University, Shanghai, 7 April 2016.
• Beijing-London-Swansea Workshop on Stochastic Analysis and Applications, Beijing Normal University, 3 April 2016.
• Nomura Mathematical Finance Seminar, Mathematical Institute, University of Oxford, 4 February 2016.
• Research Seminar in Contract Theory and Banking, Department of Banking and Finance, University of Zurich, 7 December 2015.
• Finance and Stochastic Seminar, Imperial College, 2 December 2015.
• School of Mathematical Science, South China Normal University, Guangzhou, 1 July 2015.
• Workshop on Risk and Regulation, University of Freiburg, 18 Oct 2014.
• School of Mathematical Science, South China Normal University, Guangzhou, 10 September 2014.
• The 7th International Symposium on Backward Stochastic Differential Equations, Shandong University, Weihai, 27 June 2014.
• Center for Financial Engineering, Suzhou University, 19 June 2014.
• Seminaire Triangulaire Angers-Brest-Le Mans-Rennes, Brest, France, 13 May 2014.
• SIAM Conference on Uncertainty Quantification, Savannah, U.S., 3 April 2014.
• London Mathematical Finance Seminar Series, UCL, London, 17 October 2013.
• INFORMS Annual Meeting 2013, Minneapolis, 7 October 2013.
• Financial Mathematics Seminar at Michigan, University of Michigan, 1 October 2013.
• Workshop on New Development in Stochastic Analysis: Probability and PDE interactions, Chinese Academy of Mathematics and Systems Science, Beijing, 12 July 2013.
• Risk and Stochastics Conference 2013, LSE, London, 9 May 2013.
• Economics School, Jilin University, Changchun, 27 March 2013.
• The 2013 International Conference on Financial Engineering, Suzhou, 22 March 2013.
• Stochastic Finance at Warwick Seminars, University of Warwick, 4 February 2013.
• The First Asian Quantitative Finance Conference, National University of Singapore, 9 January 2013.
• Job Interview Presentation at King's College London, 12 November 2012.
• Mathematical Department, Tongji University, Shanghai, 28 June 2012.
• The Operations Research Society and Tsinghua University/INFORMS International Meeting, Beijing, 25 June 2012.
• Stochastic Analysis and Stochastics of Financial Markets, HU and TU Berlin, Berlin, 24 May 2012.
• The 7th Oxford-Princeton Workshop on Financial Mathematics and Stochastic Analysis, Princeton, 27 April 2012.
• Department of Mathematics, The University of Texas at Austin, 20 April 2012.
• Department of Mathematics, Imperial College, London, 21 March 2012.
• Department of Mathematics, King's College London, 18 October 2011.
• School of Mathematical Science, South China Normal University, Guangzhou, 22 September, 2011.
• Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong, 21 September 2011.
• Stochastic Analysis: A UK-China Workshop, Loughborough, U.K., 26 July 2011.
• Sino-French Summer Institute in Stochastic Modeling and Applications, Chinese Academy of Mathematics and Systems Science, Beijing, 30 June 2011.
• School of Mathematical Sciences, Suzhou University, Suzhou, 12 April 2011.
• Mathematical Department, Tongji University, Shanghai, 8 and 20 April 2011.
• School of Mathematical Sciences, Fudan University, Shanghai, 7 April 2011.
• Job Interview Presentation at Mathematical Institute, University of Oxford, Oxford, 12 March 2010.
• Job Interview Presentation at Oxford-Man Institute, University of Oxford, Oxford, 10 March 2010.
• Mathematische Stochastik, University of Freiburg, Freiburg, 10 December 2009.
• The 5th Oxford-Princeton Workshop on Financial Mathematics and Stochastic Analysis, Princeton, 27 March 2009.

Contributed Presentations

• The 9th International Financial Research Forum, Paris, 22 March 2016.
• The 38th Conference on Stochastic Processes and their Applications, University of Oxford, 13 July 2015.
• The 3rd Asian Quantitative Finance Conference, Chinese University of Hong Kong, 8 July 2015.
• Mathematical Finance Internal Seminar, King's College London, 16 September 2014.
• The Second Young Researchers Meeting on BSDEs, Numerics and Finance, Bordeaux (France), 8 July 2014.
• Workshop on Applied Mathematics (marking the 80th birthday of Professor Lishang Jiang), Suzhou University (China), 21 June 2014.
• Young Finance Scholars' Conference and Quant Finance Workshop, University of Sussex, 8 May 2014.
• Stochastic Analysis and Applications Conference (marking the 60th birthday of Professor Terry Lyons), University of Oxford, 25 September 2013.
• European Financial Management Association 2013 Annual Meeting, University of Reading, Reading (U.K.), 28 June 2013.
• IMA Conference on Mathematics in Finance, Heriot-Watt University (U.K.), 8 April 2013.
• Mathematical Finance Internal Seminar, University of Oxford, Oxford, 28 February 2013.
• The 4th Berlin Workshop on Mathematical Finance for Young Researchers, Berlin, 12 October, 2012.
• Conference on Liquidity and Credit Risk, University of Freiburg, 15 March 2012.
• Mathematical Finance Internal Seminar, University of Oxford, Oxford, 16 February 2012.
• Oxford-Man Institute Internal Seminar, University of Oxford, Oxford, 15 February 2012.
• Stochastic Analysis, Lévy Processes and (B)SDEs Workshop, Innsbruck (Austria), 4 October, 2011.
• The 4th International Conference on Mathematical Finance, Kruger National Park (South Africa), 25 August, 2011.
• Mathematical Finance Internal Seminar, University of Oxford, Oxford, 2 December 2010.
• The 2nd SMAI European Summer School in Financial Mathematics, Paris, 25 August 2009.
• The 2nd International Financial Research Forum, Paris, 20 March 2009.
• The 1st European Summer School in Financial Mathematics, Paris, 12 September 2008.
• Oxford-Man Institute Internal Seminar, University of Oxford, Oxford, 23 April 2008.

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