
Mikko S. Pakkanen

Curriculum Vitae

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Personal Data

Born in Joensuu, Finland in 1983. Finnish citizen.

Education

Doctor of Philosophy in Applied Mathematics, University of Helsinki, Nov 2006 – Dec 2010.

Master of Science in Mathematics, University of Helsinki, Sep 2002 – Nov 2006.

Academic Appointments

Imperial College London, Department of Mathematics	London, United Kingdom
<i>Senior Lecturer</i>	Sep 2019 – Present
<i>Lecturer in Mathematical Finance and Statistics</i>	Nov 2014 – Aug 2019
Aarhus University, Department of Economics and Business and CREATES	Aarhus, Denmark
<i>Postdoctoral Research Fellow</i>	May 2012 – Oct 2014
<i>Research Assistant</i>	Feb 2012 – Apr 2012

Other Affiliations

International Fellow, CREATES, Aarhus University, 2015 – Present.

Fellow, Data Science Institute, Imperial College London, 2018 – Present.

Research Interests

- Statistical modelling of high-frequency financial data and market microstructure
- Volatility modelling and forecasting
- Monte Carlo methods in finance
- Limit theorems for stochastic processes
- Machine learning in finance

Invited Research Visits

Visiting Fellow at Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom, Sep – Oct 2014 (5 weeks).

Université Paris-Dauphine, CEREMADE, Paris, France, Oct 2013 (1 week).

Saarland University, Department of Mathematics, Saarbrücken, Germany, Sep 2013 (1 month).

Heidelberg University, Institute of Applied Mathematics, Heidelberg, Germany, Sep – Oct 2012 (3 weeks).

Grants and Honours

Faculty of Natural Sciences Prize for Excellence in Teaching, Imperial College London, Jun 2018.

Postdoctoral Fellowship, Academy of Finland, Sep 2012 – Oct 2014.

PhD Scholarship, Finnish Cultural Foundation, Jan 2008 – Dec 2010.

Publications

Refereed Articles in Journals

1. M. S. Pakkanen (2010): Microfoundations for diffusion price processes. *Mathematics and Financial Economics* **3**(2), 89 – 114.
2. M. S. Pakkanen (2010): Stochastic integrals and conditional full support. *Journal of Applied Probability* **47**(3), 650 – 667.
3. M. S. Pakkanen (2011): Brownian semistationary processes and conditional full support. *International Journal of Theoretical and Applied Finance* **14**(4), 579 – 586.
4. J. Lukkarinen and M. S. Pakkanen (2013): On the positivity of Riemann–Stieltjes integrals. *Bulletin of the Australian Mathematical Society* **87**(3), 400 – 405. (Erratum: *Bulletin of the Australian Mathematical Society* **89**(3), 524.)
5. J. M. Corcuera, E. Hedevang, M. S. Pakkanen and M. Podolskij (2013): Asymptotic theory for Brownian semi-stationary processes with application to turbulence. *Stochastic Processes and their Applications* **123**(7), 2552 – 2574.
6. E. Bayraktar, M. S. Pakkanen and H. Sayit (2014): On the existence of consistent price systems. *Stochastic Analysis and Applications* **32**(1), 152 – 162.
7. M. S. Pakkanen (2014): Limit theorems for power variations of ambit fields driven by white noise. *Stochastic Processes and their Applications* **124**(5), 1942 – 1973.
8. O. E. Barndorff-Nielsen, M. S. Pakkanen and J. Schmiegel (2014): Assessing relative volatility/intermittency/energy dissipation. *Electronic Journal of Statistics* **8**(2), 1996 – 2021.
9. C. Bender, M. S. Pakkanen and H. Sayit (2015): Sticky continuous processes have consistent price systems. *Journal of Applied Probability* **52**(2), 586 – 594.
10. M. S. Pakkanen and A. Réveillac (2016): Functional limit theorems for generalized variations of the fractional Brownian sheet. *Bernoulli* **22**(3), 1671 – 1708.
11. M. S. Pakkanen, T. Sottinen and A. Yazigi (2017): On the conditional small ball property of multivariate Lévy-driven moving average processes. *Stochastic Processes and their Applications* **127**(3), 749 – 782.
12. J. Lukkarinen and M. S. Pakkanen (2017): Arbitrage without borrowing or short selling? *Mathematics and Financial Economics* **11**(3), 263 – 274.
13. M. Bennedsen, A. Lunde and M. S. Pakkanen (2017): Hybrid scheme for Brownian semistationary processes. *Finance and Stochastics* **21**(4), 931 – 965.
14. R. McCrickerd and M. S. Pakkanen (2018): Turbocharging Monte Carlo pricing for the rough Bergomi model. *Quantitative Finance* **18**(11), 1877 – 1886.
15. A. Jacquier, M. S. Pakkanen and H. Stone (2018): Pathwise large deviations for the rough Bergomi model. *Journal of Applied Probability* **55**(4), 1078 – 1092.
16. M. Morariu-Patrichi and M. S. Pakkanen (2018): Hybrid marked point processes: characterisation, existence and uniqueness. *Market Microstructure and Liquidity* **4**(3&4), 1950007, 55 pp.
17. M. Bennedsen, U. Hounyo, A. Lunde and M. S. Pakkanen (2019): The local fractional bootstrap. *Scandinavian Journal of Statistics* **46**(1), 329 – 359.

18. C. Heinrich, M. S. Pakkanen and A. E. D. Veraart (2019): Hybrid simulation scheme for volatility modulated moving average fields. *Mathematics and Computers in Simulation* **166**, 224 – 244.
19. M. Bennedsen, A. Lunde and M. S. Pakkanen (2020⁺): Decoupling the short- and long-term behavior of stochastic volatility. *Journal of Financial Econometrics*, to appear.
20. M. S. Pakkanen, R. Passeggeri, O. Sauri and A. E. D. Veraart (2021⁺): Limit theorems for trawl processes. *Electronic Journal of Probability*, to appear.

Refereed Contributions to Edited Volumes

21. B. Horvath, A. Muguruza Gonzalez and M. S. Pakkanen (2021⁺): Harnessing quantitative finance by data-centric methods. In A. Capponi and C.-A. Lehalle (eds): *Machine Learning in Financial Markets: A Guide to Contemporary Practice*, Cambridge University Press, to appear.

Refereed Articles in Conference Proceedings

22. E. Lappi, M. S. Pakkanen and B. Åkesson (2012): An approximative method of simulating a duel. *Proceedings of the 2012 Winter Simulation Conference (Berlin, Dec 2012)*, pp. 2230 – 2339.

Preprints

23. M. Morariu-Patrichi and M. S. Pakkanen (2018): State-dependent Hawkes processes and their application to limit order book modelling. Available as [arXiv:1809.08060](https://arxiv.org/abs/1809.08060), 30 pages.
24. P. Murray, R. Passeggeri, A. E. D. Veraart and M. S. Pakkanen (2020): Feasible inference for stochastic volatility in Brownian semistationary processes. Available as [arXiv:2007.06357](https://arxiv.org/abs/2007.06357), 21 pages.
25. A. E. Bolko, K. Christensen, M. S. Pakkanen and B. Veliyev (2020): Roughness in spot variance? A GMM approach for estimation of fractional log-normal stochastic volatility models using realized measures. Available as [arXiv:2010.04610](https://arxiv.org/abs/2010.04610), 42 pages.
26. H. Buehler, P. Murray, M. S. Pakkanen and Ben Wood (2021): Deep hedging: Learning risk-neutral implied volatility dynamics. Available as [arXiv:2103.11948](https://arxiv.org/abs/2103.11948), 18 pages.
27. T. Hengstberger and M. S. Pakkanen (2021): Increasing venture capital investment success rates through machine learning. 36 pages.
28. T. Berah, T. A. Mellan, X. Miscouridou, S. Mishra, K. V. Parag, M. S. Pakkanen and S. Bhatt (2021): Unifying the effective reproduction number, incidence, and prevalence under a stochastic age-dependent branching process. Available as [arXiv:2107.05579](https://arxiv.org/abs/2107.05579), 72 pages.

Book Reviews

- ◇ M. S. Pakkanen (2018): Review of “Quantitative Trading: Algorithms, Analytics, Data, Models, Optimization” by X. Guo, T. L. Lai, H. Shek and S. P. Wong. *The American Statistician* **72**(1), 112 – 113.

Selected Presentations

Invited Talks at Conferences and Workshops

Mini-symposium on Machine Learning Applications in Computational Finance, SIAM Conference on Financial Mathematics and Engineering (FM21), online, Jun 2021.

Market Microstructure: The CFM–Imperial Workshop, HSBC, London, United Kingdom, Dec 2019.

CFM–Imperial Day, Capital Fund Management, Paris, France, Oct 2019.

Fourth Conference on Ambit Fields and Related Topics, Sandbjerg, Denmark, Aug 2019.

The 2nd CUHK–Imperial Workshop on Quantitative Finance, The Chinese University of Hong Kong, Sha Tin, Hong Kong SAR, China, May 2019.

QuantMinds International, Vienna, Austria, May 2019.

The 12th International Conference on Computational and Financial Econometrics, Pisa, Italy, Dec 2018.

Third Conference on Ambit Fields and Related Topics, Aarhus, Denmark, Aug 2018.

The 9th International Workshop on Applied Probability, Budapest, Hungary, Jun 2018.

QuantMinds International, Lisbon, Portugal, May 2018.

Jim Gatheral’s 60th Birthday Conference, Courant Institute of Mathematical Sciences, NYU, New York, USA, Oct 2017.

Second Conference on Ambit Fields and Related Topics, Aarhus, Denmark, Aug 2017.

Recent Developments in Numerical Methods with Applications in Statistics and Finance, Mannheim, Germany, Jun 2017.

Fractional Brownian Motion and Rough Models, Barcelona GSE Summer Forum, Barcelona, Spain, Jun 2017.

Advances in Financial Mathematics, Paris, France, Jan 2017.

Rough Volatility Meeting, London, United Kingdom, Oct 2016.

Conference on Ambit Fields and Related Topics, Aarhus, Denmark, Aug 2016.

At the Frontiers of Quantitative Finance, ICMS, Edinburgh, United Kingdom, Jun 2016.

London–Paris Bachelier Workshop on Mathematical Finance 2015, London, United Kingdom, Sept 2015.

Aarhus Conference on Probability, Statistics and Their Applications, Aarhus, Denmark, Jun 2015.

The 4th Finnish-Estonian Mathematical Colloquium & Finnish Mathematical Days 2014, Helsinki, Finland, Jan 2014.

AHOI Workshop for Ambit Stochastics and Applications, London, United Kingdom, Mar 2013.

CREATES Annual Meeting, Sandbjerg, Denmark, Aug 2012.

Workshop on Ambit Processes, Non-Semimartingales and Applications, Sandbjerg, Denmark, Jan 2010.

Finnish Mathematical Days 2010, Jyväskylä, Finland, Jan 2010.

Seminars

Department of Mathematical Sciences, University of Copenhagen, Copenhagen, Denmark, Apr 2021 (online).

Department of Mathematics and Statistics, University of Ottawa, Ottawa, Canada, Jun 2019.

Goldman Sachs, London, United Kingdom, Jan 2019.

QuantPORT, Jefferies, London, United Kingdom, Nov 2018.

Financial Engineering Workshop, Cass Business School, London, United Kingdom, Oct 2018.

London Mathematical Finance Seminar, London, United Kingdom, Oct 2016.

Séminaire de Probabilités, IMT/Université Paul Sabatier, Toulouse, France, Dec 2015.

Groupe de Travail: Finance mathématique, probabilités numériques et statistique des processus, LPMA/Université Paris Diderot, Paris, France, Nov 2015.

Finance and Stochastics Seminar, Imperial College London, London, United Kingdom, May 2014.

Oberseminar zur Stochastik, Saarland University, Saarbrücken, Germany, Sep 2013.

Statistics Seminar, Heidelberg University, Heidelberg, Germany, Oct 2012.

Contributed Talks at Conferences and Workshops

Frontiers in High-Frequency Financial Econometrics, Pisa, Italy, Sep 2018.

Financial Econometrics Conference: Market Microstructure, Limit Order Books and Derivatives Markets, Lancaster, United Kingdom, Sep 2018.

Imperial–ETH Workshop on Mathematical Finance 2018, Zurich, Switzerland, Apr 2018.

WPI Mini-Workshop on Random Fields in Energy and Weather Finance, Vienna, Austria, Apr 2014.

OMI–SoFiE Financial Econometrics Summer School, Oxford, United Kingdom, Jul 2012.

The 73rd Annual Meeting of the Institute of Mathematical Statistics, Gothenburg, Sweden, Aug 2010.

The 33rd Conference on Stochastic Processes and Their Applications, Berlin, Germany, Jul 2009.

Non-Semimartingale Techniques in Mathematical Finance, Espoo, Finland, May 2009.

Workshop on Mathematical Finance for Young Researchers, Berlin, Germany, Oct 2008.

Teaching

Experience as Instructor

Financial Market Volatility (MSc in Economics and Management, Aarhus University, Spring 2013, Spring 2014).

Quantitative Risk Management (MSc in Mathematics and Finance, Imperial College London, Autumn 2014, Autumn 2015, Autumn 2016, Autumn 2017, Autumn 2018, Autumn 2019).

Pricing and Hedging in Financial Markets (MSc in Statistics, Imperial College London, Spring 2015, Spring 2016, Spring 2017, Spring 2018).

Financial Econometrics (MSc in Statistics, Imperial College London, Spring 2016, Spring 2017, Spring 2018).

Introduction to Statistical Finance (MSc in Statistics, Imperial College London, Spring 2019, Spring 2020).

Advanced Statistical Finance (MSc in Statistics, Imperial College London, Spring 2019, Spring 2020).

Deep Learning (MSc in Mathematics and Finance, Imperial College London, Autumn 2019, Autumn 2020).

Experience as Teaching Assistant

Mathematical Finance (MSc in Applied Mathematics, University of Helsinki, Autumn 2007).

Stochastic Analysis (MSc in Applied Mathematics, University of Helsinki, Spring 2008).

Statistical Inference (BSc in Statistics, University of Helsinki, Autumn 2008 – Spring 2009).

Advanced Statistical Inference (MSc in Statistics, University of Helsinki, Autumn 2009).

Teaching Qualifications

Pedagogical Training Course for Assistant Professors and Post Docs (“adjunktpædagogikum”) at Aarhus University, Aug 2012 – Jan 2013.

Fellow of the Higher Education Academy (UK), since Oct 2017.

Supervision, Mentoring and Examining

Postdoctoral Research Associates

Peter Sozou (Department of Mathematics, Imperial College London), Sep 2019 – Sep 2020.

Postgraduate Research Students

Sole or Co-Supervisor

Maxime Morariu-Patrichi (MRes + PhD, Imperial College London), Oct 2014 – Oct 2018.

PhD thesis: *High-frequency financial data modelling with hybrid marked point processes*

Viva voce: 28 Nov 2018

★ *Doris Chen Merit Award* (Dept. of Mathematics, Imperial College London, Jul 2018)

Henry Stone (MRes + PhD, Imperial College London, joint with Antoine Jacquier), Oct 2015 – Oct 2019.

PhD thesis: *Rough volatility models: Small-time asymptotics and calibration*

Viva voce: 17 Dec 2019

Douglas Machado Vieira (PhD student, Imperial College London, joint with Rama Cont), Nov 2018 – Sep 2020.

Ryan McCrickerd (MRes + PhD student, Imperial College London, joint with Martin Rasmussen), Oct 2016 – Mar 2021.

Phillip Murray (PhD student, Imperial College London, joint with Almut Veraart), Oct 2019 – Present.

Nikolai Rozanov (PhD student, Imperial College London), Nov 2019 – Present.

Tresnia Berah (PhD student, Imperial College London, joint with Seth Flaxman), Oct 2020 – Present.

Yuan Li (PhD student, Imperial College London, joint with Almut Veraart and Tobias Fissler), Oct 2020 – Present.

Secondary Supervisor

Théophile Griveau-Billion (PhD student, Imperial College London, primary supervisor: Ben Calderhead), Oct 2019 – Oct 2020.

Žan Žurič (PhD student, Imperial College London, primary supervisor: Antoine Jacquier), Oct 2019 – Present.

Visiting Research Students

Claudio Heinrich (PhD student, Aarhus University, joint with Almut Veraart), Spring 2017.

Anine Eg Bolko (PhD student, Aarhus University), Spring – Summer 2019.

Taught Postgraduate and Undergraduate Students

Supervised 2 BSc (M3R), 10 MSci (M4R) and 40 MSc final projects (of which 20 joint with external partners) at Imperial College London since Nov 2014.

Examination Committees

Pierre Blaque-Florentin (PhD, Imperial, Oct 2016), Sergey Badikov (PhD, Imperial, Oct 2017), Fangwei Shi (PhD, Imperial, Feb 2018), Hao Liu (PhD, Imperial, May 2018), Nicola Pede (PhD, Imperial, May 2018), Dmitry Otryakhin (PhD, Aarhus, Sep 2019), Hong Liu (MPhil, King's College London, Dec 2019).

Other

Team Mentor, The 6th Financial Mathematics Team Challenge, University of Cape Town, Cape Town, South Africa, 25 Jun – 4 Jul 2019.

Other Professional Activities

Leadership and Management

Co-Director, *EPSRC Centre for Doctoral Training in Financial Computing & Analytics*, Jul 2018 – Present.

Co-Director, *MSc in Mathematics and Finance* at Imperial College London, Aug 2018 – Sep 2020.

Leader and Founder, *Imperial Network of Excellence in Probabilistic Methods and Modelling* at Imperial College London, Jul 2017 – Jul 2019.

Conference, Workshop and Seminar Organisation

Co-Organiser, *Workshop on Finance, Insurance, Probability and Statistics (FIPS 2018)*, London, 10 – 11 Sep 2018.

Co-Organiser, *Conference on Mathematical Modelling in Finance*, London, 30 Aug – 2 Sep 2017.

Co-Organiser, *International Workshop on Spatio-Temporal Statistics*, London, 18 – 20 Apr 2016.

Co-Organiser, *AHOI Workshop on Tempo-Spatial Stochastic Processes and Stochastic Volatility*, London, 23 – 24 Feb 2015.

Co-Organiser, *Finance and Stochastics Seminar* at Imperial College London, Autumn 2014 – Spring 2018.

Editorial Work, Refereeing and Memberships in Learned Societies

Associate Editor, *Journal of the American Statistical Association/The American Statistician (reviews)*, 2020 – Present.

Referee for *The Annals of Applied Probability, The Annals of Statistics, Bernoulli, Biometrika, Decisions in Economics and Finance, Electronic Communications in Probability, Finance and Stochastics, Journal of Financial Econometrics, Journal of Futures Markets, Journal of Statistical Mechanics: Theory and Experiment, Mathematical Finance, Mathematics and Computers in Simulation, Probability and Mathematical Statistics, Probability Theory and Related Fields, Quantitative Finance, Risk, SIAM Journal on Financial Mathematics, Stochastic Analysis and Applications, Stochastic Models, Stochastic Processes and their Applications, Teoriya Veroyatnostei i ee Primeneniya; CRC Press, Oxford University Press (book proposals)*.

Reviewer for *Zentralblatt MATH*, 2011 – 2016.

Member of *Bernoulli Society*.

Non-Academic Experience

Military service in the Finnish Defence Forces, including 5 months of work on operations research at the Defence Forces' Technical Research Centre, PVTT, Jan 2011 – Jan 2012.

Internships at Pellervo Economic Research Institute, Helsinki, Finland, Summer 2004 and Summer 2005.