

Christian Bayer

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Born: November 23, 1979—Linz, Austria

Nationality: Austria

Current position

Research Group Leader (acting), Weierstrass Institute, Berlin

Areas of specialization

Stochastic numerics; Quantitative finance; Rough paths.

Academic career

2008	Postdoc, Institute of Applied Mathematics, University of Bonn
2008–2009	Postdoc, Institute of Mathematics, KTH, Stockholm
2009–2010	Postdoc, Institute of Mathematics, TU Berlin
2010–2012	Assistant Professor, Institute of Mathematics, University of Vienna
2012–present	Research scientist (Wissenschaftlicher Mitarbeiter), Weierstrass Institute, Berlin
2015	Visiting Professor, Humboldt Universität zu Berlin (at leave from Weierstrass Institute)
2024–2025	Deputy Research Group Leader, Weierstrass Institute, Berlin
2025– present	Research group leader (acting), Weierstrass Institute, Berlin

Education

2004	DI in Mathematics, TU Wien
2009	PhD (Dr. tech.) in Mathematics, TU Wien
2019	Habilitation in Mathematics, TU Berlin

Grants

- 2015 DFG research grant BA 5484/1 “Rough stochastic volatility and related topics”
- 2016 DFG research unit FOR 2402 “Rough paths, stochastic partial differential equations and related topics”, Project on “Numerical analysis of rough PDEs”; continued in 2019
- 2019 DFG cluster of excellence MATH+ project EF1-5 “On robustness of deep neural networks”
- 2019 DFG cluster of excellence MATH+ project AA4-2 “Optimal control in energy markets using rough analysis and deep networks”, continued in 2021
- 2020 DFG International Research Training Group IRTG 2544 “Stochastic Analysis in Interaction”, continued in 2024
- 2021 DFG cluster of excellence MATH+ project EF1-13 “Stochastic and Rough Aspects in Deep Neural Networks”
- 2022 DFG cluster of excellence MATH+ project “Volatile Electricity Markets and Battery Storage: A Model-Based Approach for Optimal Control”
- 2024 DFG CRC/TRR 388 “Rough Analysis, Stochastic Dynamics and Related Fields”, PI of three sub-projects (“Project Bo1: Statistical learning from path observations”, “Project Bo2: Microstructural foundations of rough volatility models”, “Project Bo3: Signature methods for optimal control in finance”)
- 2025 DFG cluster of excellence MATH+ project MDU-3: “Scaling Limits of Deep Neural Networks: Rough Analysis Meets Optimization”

Publications (selected)

Books

- 2023 Christian Bayer, Peter K. Friz, Masaaki Fukasawa, Jim Gatheral, Antoine Jacquier, and Mathieu Rosenbaum (editors): *Rough Volatility*, Financial Mathematics, SIAM, 2023.
- 2025 Christian Bayer, Goncalo dos Reis, Blanka Horvath, Harald Oberhauser (editors): *Signature Methods in Finance: An Introduction with Computational Applications*, Springer Finance, Springer Cham, to appear.

Journal articles

- 2014 Christian Bayer, John Schoenmakers: *Simulation of conditional diffusions via forward-reverse stochastic representations*, Annals of Applied Probability 24(5), 1994–2032, 2014.
- 2014 Christian Bayer, Peter Laurence: *Asymptotics beats Monte Carlo: The case of correlated CEV baskets*, Communications on Pure and Applied Mathematics, 67(10):1618–1657, 2014.
- 2016 Christian Bayer, Peter Friz, Sebastian Riedel, John Schoenmakers: *From rough-path estimates to multi-level Monte Carlo*, SINUM 4(3), 1449–1483, 2016.
- 2016 Christian Bayer, Peter Friz, Jim Gatheral: *Pricing under rough volatility*, Quantitative Finance, 16(6), 887–904, 2016.
- 2017 Christian Bayer, Ulrich Horst, Jinniao Qiu: *A functional limit theorem for limit order books with state dependent price dynamics*, Annals of Applied Probability, 27(5), 2753–2806, 2017.
- 2020 Christian Bayer, Peter Friz, Paul Gassiat, Jörg Martin, Benjamin Stemper: *A regularity structure for rough volatility*, Mathematical Finance 30(3), 782–832, 2020.

- 2022 Christian Bayer, Jinniao Qiu, Yao Yao: *Pricing Options Under Rough Volatility with Backward SPDEs*, SIAM Journal on Financial Mathematics 13 (1), 179–212, 2022.
- 2022 Christian Bayer, Masaaki Fukasawa, Shonosuke Nakahara: *On the weak convergence rate in the discretization of rough volatility models*, SIAM Journal on Financial Mathematics 13(2), 2022.
- 2023 Christian Bayer, Peter Friz, Nikolas Tapia: *Stability of Deep Neural Networks via discrete rough paths*, SIAM Journal on Mathematics of Data Science 5, 2023.
- 2023 Christian Bayer, Paul Hager, Sebastian Riedel, John Schoenmakers: *Optimal stopping with signatures*, Annals of Applied Probability 33(1), 238–273, 2023.
- 2024 Christian Bayer, Denis Belomestny, Oleg Butkovsky, John Schoenmakers: *RKHS regularization of singular local stochastic volatility McKean-Vlasov models*, Finance & Stochastic 28 (4), 1147–1178, 2024.
- 2024 Christian Bayer, Chiheb Ben Hammouda, Raul Tempone: *Multilevel Monte Carlo with numerical smoothing for robust and efficient computation of probabilities and densities*, SIAM Journal on Scientific Computing 46 (3), A1514–A1548, 2024.
- 2025 Peter Bank, Christian Bayer, Peter Friz, Luca Pelizzari: *Rough PDEs for local stochastic volatility models*, Mathematical Finance, online, 2025.
- 2025 Christian Bayer, Luca Pelizzari, John Schoenmakers: *Primal and dual optimal stopping with signatures*, Finance & Stochastic 29, 981–1014, 2025.
- 2025 Peter Bank, Christian Bayer, Paul Hager, Tobias Nauen, Sebastian Riedel: *Stochastic control with signatures*, SIAM Journal on Control and Optimization 63:5, online, 2025.