Institut für Statistik und Operations Research
Department of Statistics and Operations Research

universität wien

ANNUAL REPORT 2022

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1 Foreword

I am pleased to present the Annual Report of the Department of Statistics and Operations Research, which documents some of the many achievements in 2022. The Department of Statistics and Operations Research is part of the Faculty of Business, Economics, and Statistics of the University of Vienna. Faculty members are active in research in various fields of Statistics, Econometrics, Operations Research, Applied Mathematics, and Computer Science. The department offers degree programs in Statistics at the Bachelor, Master, and PhD-level. Members of the department are also active in service teaching for other departments of the faculty, including the Department of Business Administration and the Department of Economics.

New PhD students (Prae-doc) starting in 2022 were Azadeh Mirtaheri, Ilaria Nadin, and Daniel Peer. We wish them success in their studies. Luca Marie Knobloch and Viktoria Schildhammer joined our department as administrative assistants, and Boris Villagarcia Paliza as system administrator. We are delighted to welcome all of them in our team.

There were also a few departures in 2022: Michael Kahr (Prae-doc), Vera Lehmwald (Organisational Assistant) and Christian Zwatz (Prae-doc) left our department. Manveer Mangat (Prae-doc) successfully defended her thesis and graduated from the PhD Programme in Statistics and Operations Research and Stefan Rigger (Prae-doc) successfully defended his thesis and graduated from the PhD Programme in Mathematics. Our Postdoc Peter Kramlinger was accepted by the renowned University of California - Davis to work as a Visiting Assistant Professor at the Department of Statistics and therefore also left our department. We wish them all well in their new endeavours.

I would like to express special thanks to Birgit Ewald, Luca Marie Knobloch, Manuela Nicham-Zorn, Viktoria Schildhammer and Sabine Sobotka-Tompits for editing the Annual Report 2022.

Moritz Jirak

(Head of Department)

Vienna, September 2023

2 Faculty and Staff

Faculty

Ilya Archakov (Dr.)	Financial Econometrics
Immanuel Bomze (Prof.)	Operations Research and Quantitative Decision Support, Game Theory and Modelling of Behaviour, Optimization Theory and Application, Asymptotic Statistics, Stochastic Modelling, Dynamical Systems
Christa Cuchiero (Prof.)	Mathematical Finance and Quantitative Risk Management (Data Driven Risk Inference, Stochastic Volatility, Stochastic Portfolio Theory, Robust Portfolio Optimization, Arbitrage Theory, Interest Rate Theory, Systemic Risk), Machine Learning in Finance and Economics, Stochastic Processes in Finite and Infinite Dimensions, McKean Vlasov Equations, Interacting Particle Systems and Mean Field Games , Statistics of Stochastic Processes, Statistics with High-Frequency Data, Covariance Estimation, Robust Model Calibration, Universal Approximation Theorems in Dynamic Situations
Solomiia Dmytriv (Dr.)	High-Dimensional Statistics and Random Matrix Theory, Statistical Inference, Portfolio Optimization
Gianluca Finocchio (Dr.)	Partial Least Squares for Classification, Bayesian Statistics, Neural Networks, Empirical Processes, Robust Estimation
Luca Gonzato (Dr.)	Financial Econometrics, Sequential Monte Carlo Methods, Option Pricing, Stochastic Volatility Models
Nikolaus Hautsch (Prof.)	Financial Econometrics, Econometric Modelling of Financial High-Frequency Data, Time Series Econometrics, Time-Varying Volatility and Correlation, Market Liquidity, Market Microstructure Analysis, Systemic Risk, Information Processing on Financial Markets, Risk Management
Florian Huber (Dr.)	Stochastic partial differential equations, Stochastic analysis, Rough paths
Johannes Moritz Jirak (Prof.)	High-Dimensional Statistics, Principal Component Analysis, High Frequency Analysis, Time Series Analysis, Nonparametric, Irregular Models
Georg Keilbar (PhD)	Non- and Semiparametric Statistics, Quantile Regression, Machine Learning
Irene Klein (Assoc. Prof.)	Stochastic Finance

Peter Kramlinger (Dr.)	Statistical Inference, Mixed Effect Models, Small Area Estimation
Tatyana Krivobokova (Prof.)	High-dimensional Statistics and Dimension reduction, Covariance matrix estimation, Simultaneous inference, Non-parametric and Bayesian modelling and inference
Hannes Leeb (Prof.)	Model Selection and Predictive Inference when the Number of Parameters is of the Same Order as Sample Size, Inference when Fitting Mis-Specified Models. Admissibility of Confidence Sets, Pitfalls in Inference after Model Selection when Using Traditional Approaches
Benedikt Pötscher (Prof.)	Econometrics, Statistics, Time Series Analysis
Erhard Reschenhofer (Assoc. Prof.)	Time Series Analysis, Financial Econometrics, Automatic Model Selection
Werner Schachinger (Assoc. Prof.)	Optimization, Probabilistic Analysis of Algorithms
Lukas Steinberger (Ass.-Prof.)	Statistical Inference under Differential Privacy, High-Dimensional Data Analysis, Predictive Inference, Model Selection, Statistical vs. Computational Efficiency

Retired Faculty

Walter J. Gutjahr (Prof.)	Optimization Theory, Discrete Optimization, Stochastic Modeling, Multicriteria Decision Analysis
Georg Pflug (Prof.)	Mathematical Statistics, Stochastic Optimization, Risk Management

PhD Students

Nicolai Amann (Dipl.-Ing.)	Predictive Inference & Model Selection in High-Dimensional Linear Models
Benedict Bauer (MSc ETH)	Gaussian Processes, Large Deviations in Rough Volatility Models, Schrödinger Bridges
Xandro Bayer (MSc)	Machine Learning with Applications in Finance
Yuan Chen (MSc ETH)	Financial Econometrics and Portfolio Management
Guido Gazzani (MSc)	Machine Learning in Finance, Robust Calibration, Robust Risk Assessment
Fabio Kalix (MSc)	Weak Dependence, High-Dimensional Limit Theorems and Quantitative Bounds, Bootstrap

Karolina Klockmann (M.Sc.)	Non-Parametric Bayesian Modelling and Inference, Covariance Matrix Estimation
Georg Köstenberger (Dipl.-Ing.)	High-Dimensional Statistics, Random Matrix Theory, Topological Properties of Stochastic Processes
Manveer Mangat (MSc)	Times Series Analysis, Financial Econometrics
Janka Möller (MSc ETH)	Machine Learning in Finance, Stochastic Portfolio Theory
Ilaria Nadin (Dott.)	Bayesian Modelling and Inference, High Dimensional Statistics and Dimension Reduction, Stochastic Processes and Statistical Methods for Evolutionary Biology, Machine Learning, AI and Statistical Methods for Illness Diagnosis
Daniel Peer (Dipl.-Ing.)	Topological Data Analysis, Machine Learning, Bootstrap and (Asymptotic) Expansions
Francesca Primavera (Dott.)	Stochastic Modeling, Mathematical Finance
Stefan Rigger (Dipl.-Ing.)	Interacting Particle Systems, McKean-Vlasov problems, Mean Field Limits and Mean Field Games
Thomas Stark (Mag.)	Time Series Analysis, Financial Econometrics
Christian Zwatz (Mag.)	Autocorrelation Robust Testing, Spatial Econometrics

External Lecturers (Academic Year 2021/2022)

Andreas Baierl (University of Vienna), Johann Brandstetter (University of Vienna), Katharina Brazda (University of Vienna), Evelina Erlacher (University of Vienna), Florian Frommlet (MedUni Vienna), Markus Gabl (IOR, KIT), Sándor Guzmics (University of Vienna), Danijel Kivaranovic (Dext.ai Vienna), Raimund Kovacevic (Donau-Uni-Krems), Christoph Krall (University of Vienna), Manveer Mangat (University of Vienna), Ivana Milovic (University of Vienna), Daniel Obszelka (University of Vienna), Robin Ristl (MedUni Vienna), Theresa Scharl-Hirsch (BOKU Vienna), Leopold Sögner (IHS Vienna), Christian Spreitzer (University of Vienna), Harald Stockinger (FH Technikum Wien), Gerhard Svolba (SAS Institute Inc.), Susanne Teschl (FH Technikum Wien), Alexander Tichy (VetMedUni Vienna), Fabio Tonti (University of Vienna), Bertram Tschiderer (University of Vienna), Gabriele Uchida (University of Vienna), Claus Vogl (VetMedUni Vienna), Bertram Wassermann (University of Vienna), Christian Zwatz (University of Vienna)

Teaching Assistants (Academic Year 2021/2022)

Jasia Alam, Anja Bohatschek, Dávid Chmelík, Julian Feurhuber, Yu Jin, Benjamin Karimaei, Karol Kulma, Lorenz Matz, Benjamin Riesch, Nela Šalamon, Manuel Schuller, Marlene Steiner, Chiara Valentin, Luzi Watzinger, Elisabeth Wimmer, Lusine Yeghiazaryan

Administrative Assistants

Birgit Ewald, Luca Marie Knobloch, Vera Lehmwald, Manuela Nicham-Zorn, Viktoria Schildhammer, Sabine Sobotka-Tompits

System Administrators

Stefan Geißler, Andreas Loibl, Svetlana Mihajlovic, Soheil Nejadi, Boris Villagarcia Paliza

3 Visitors

Eduardo Abi Jaber (Ecole Polytechnique, France), Carlo Bellingeri (TU Berlin, Germany), Markus Bibinger (Universität Würzburg), Victor-Emmanuel Brunel (ENSAE-CREST, France), Sonja Cox (University of Amsterdam, Netherlands), Farida Enikeeva (Université de Poitiers, France), Annika Kemper (Bielefeld University, Germany), Asma Khedher (University of Amsterdam, Netherlands), Shaun Li (Ecole Polytechnique, France), Sergio Pulido (École Nationale Supérieure d'Informatique pour l'Industrie et l'Entreprise, France), Thorsten Schmid (Uni Freiburg, Germany), Mykhaylo Shkolnikov (Princeton University, USA), Sara Svaluto-Ferro (University of Verona, Italy), Alexandre Tsybakov (ENSAE-CREST, France)

4 Teaching

Theses Supervised

PhD Theses in Progress

Supervisor	Author	Title
Christa Cuchiero, Stefan Gerhold (TU Wien)	Benedict Bauer	Aspects of rough volatility modeling: from Gaussian Markov processes to VIX option calibration via large deviations principles and Schrödinger bridges
Christa Cuchiero, Zehra Eksi (WU Vienna)	Eva Flonner	Bayesian and Machine Learning Methods for Calibration and Estimation of Financial Models
Christa Cuchiero, Irene Klein	Guido Gazzani	Signature based models in finance and robust risk measures

Christa Cuchiero	Janka Möller	Signature methods for stochastic portfolio theory
Christa Cuchiero	Francesca Primavera	Signature methods from a polynomial and affine point of view
Nikolaus Hautsch	Xandro Bayer	TBA
Nikolaus Hautsch	Aron Bodisz	TBA
Nikolaus Hautsch	Yuan Chen	TBA
Moritz Jirak	Fabio Kalix	High-dimensional change point analysis
Moritz Jirak	Georg Köstenberger	Asymptotically efficient Model Selection under Dependence
Moritz Jirak	Daniel Peer	An approximation for the quantils of the maxima
Tatyana Krivobokova (2nd supervisor)	Anita Gyorfi	Essays in Applied Econometrics
Tatyana Krivobokova	Karolina Klockmann	On Periodograms and Efficient Nonparametric Toeplitz Covariance Matrix Estimators
Tatyana Krivobokova	Ilaria Nadin	Change-point detection in mean and covariance of Gaussian processes
Hannes Leeb, Lukas Steinberger (2nd supervisor)	Nicolai Amann	Assumption-lean conditional predictive inference via the Jackknife
Benedikt Pötscher	Christian Zwatz	Size and Power Properties of Heteroskedasticity and Autocorrelation Robust Tests in Spatial Error Models
Lukas Steinberger	Thomas Stark	Implicit vs. explicit regularization for gradient descent in high-dimensional prediction

PhD Theses Finished

Supervisor	**Author**	**Title**
Christa Cuchiero, Luca di Persio (Univ. Trento and Verona)	Francesco Guida	Measure-valued affine and polynomial diffusions and applications to energy modeling
Christa Cuchiero (member of committee)	Sven Karbach	Stochastic covariance models in Hilbert spaces with jumps

Christa Cuchiero (member of committee)	Carl Remlinger	Génération de séries temporelles et apprentissagepar renforcement
Christa Cuchiero	Stefan Rigger	Probabilistic solutions of the supercooled Stefan problem
Christa Cuchiero (member of committee)	Sigurd Emil Rømer	Essays on rough and classical stochastic volatility
Erhard Reschenhofer	Manveer K. Mangat	Essays on volatility forecasting and directional forecasting based on long-range dependence

Master Theses in Progress

Supervisor	Author	Title
Christa Cuchiero	Fabian Horacek	TBA
Christa Cuchiero	Elena Lyubarskaya	Deep generative models for returns time series with short interest
Christa Cuchiero	Valentin Schmidts	TBA
Christa Cuchiero	Felix Stubenvoll	TBA
Nikolaus Hautsch	Benjamin Jaquemar	Modelling Bitcoin Volatility
Nikolaus Hautsch	Azar Karimov	Minimum Quantity at Touch and its effects on market microstructure
Nikolaus Hautsch	Zhuxi Pang	Will the outbreak of Coronavirus disease (COVID-19) affect the stock markets of infected countries?
Irene Klein	Yevheniia Volkova	Asymptotic arbitrage concepts and equivalent martingale measures for large financial markets in discrete time
Hannes Leeb	Julia Heyne	Auslastungsprognose bei den ÖBB: Einflussfaktoren auf den Anteil buchungskonformer Zugfahrten – eine quantitative Analyse zur Modellverbesserung
Hannes Leeb	Dmytro Rzhemovskyi	Mathematical aspects of applying conformal prediction to regression models
Erhard Reschenhofer	Georg Goldenits	Schätzung von Zeitkartenanteilen auf Fernverkehrszügen der ÖBB
Erhard Reschenhofer	Matthias Hauser	Bayesian Sparse Global-Local Shrinkage Regression in MIDAS Framework

Erhard Reschenhofer	Nevena Janosevic	A comparison between machine learning and classical forecasting methods
Werner Schachinger	Simon Klima	Random Graphs and the Giant Component
Werner Schachinger	Rafael Jochum	Verzweigungsprozesse – Theorie und Anwendung

Master Theses Finished

Supervisor	Author	Title
Christa Cuchiero	Abdiu Fation	The effects on inclusion and exclusion of the German midcap index on stock returns
Nikolaus Hautsch	Julian Feurhuber	Intraday Dynamics of Option-Implied Variance
Nikolaus Hautsch	Tobias Forster	Intraday-Preisprognose am Strommarkt
Nikolaus Hautsch	Yelena Holzer	Trading Frictions and Arbitrage in the Bitcoin Market
Nikolaus Hautsch	Robert Peuter	The pulse of the stock market
Nikolaus Hautsch	David Sandahl und Mathias Axel Broman	Optimal Number of Portfolio Holdings for Small Cap Mutual Funds – An Analysis of Diversification Benefits and Costs
Erhard Reschenhofer	Thomas Moser	Die Umwelt-Kuznets-Kurve für CO2 Emissionen – eine Paneldatenanalyse
Erhard Reschenhofer	Levin Tröster	Zeitreihenanalyse von globalen Temperaturdaten unter zeitlichem und geografischem Aspekt
Erhard Reschenhofer	Tugce Tuncer	Using multiple methods to forecast CO2 emissions in diverse contexts
Erhard Reschenhofer	David Wögerer	A Comparative Analysis of Equity Premium Prediction via Machine Learning
Lukas Steinberger	Maximilian Pfeiffer	Modelle zur Prognose der Leistung von Photovoltaikanlagen mittels Wettervorhersagen

Bachelor Theses

Christa Cuchiero (3), Moritz Jirak (10), Gianluca Finocchio (1), Fabio Kalix (8), Peter Kramlinger (2)

5 Publications

Journal Articles

Andersen, T. G., **Archakov, I.**, **Cebiroglu, G.** & **Hautsch, N.**: Local mispricing and microstructural noise: A parametric perspective. In: *Journal of Econometrics*. 2022; 230, 2, pp. 510-534, 25 p., https://doi.org/10.1016/j.jeconom.2021.06.006

Archakov, I. & Hansen, P. R.: A Canonical Representation of Block Matrices with Applications to Covariance and Correlation Matrices. In: *The Review of Economics and Statistics*. 2022; pp. 1-39, 39 p., https://doi.org/10.1162/rest_a_01258

Bettiol, E., **Bomze, I.**, Létocart, L., Rinaldi, F. & Traversi, E.: Mining for diamonds—Matrix generation algorithms for binary quadratically constrained quadratic problems. In: *Computers and Operations Research*. 2022; 142, https://doi.org/10.1016/j.cor.2022.105735

Bomze, I. & **Peng, B.**: Conic formulation of QPCCs applied to truly sparse QPs. In: *Computational Optimization and Applications: an international journal*. 2023; 84, 3, pp. 703-735, 33 p., https://doi.org/10.1007/s10589-022-00440-5 *(online first 2022)*

Bomze, I., Rinaldi, F. & Zeffiro, D.: Fast Cluster Detection in Networks by First-Order Optimization. In: *SIAM Journal on Mathematics of Data Science*. 2022; 4, 1, pp. 285-305, 21 p., https://doi.org/10.1137/21M1408658

Bomze, I. & **Gabl, M.**: Optimization under uncertainty and risk: Quadratic and copositive approaches. In: *European Journal of Operational Research*. 2023; 310, 2, pp. 449-476, 28 p., https://doi.org/10.1016/j.ejor.2022.11.020 *(online first 2022)*

Bomze, I., **Gabl, M.**, Maggioni, F. & **Pflug, G.**: Two-stage stochastic standard quadratic optimization. In: *European Journal of Operational Research*. 2022; 299, 1, pp. 21-34, 14 p., https://doi.org/10.1016/j.ejor.2021.10.056

Bomze, I. & **Gabl, M.**: Uncertainty Preferences in Robust Mixed-Integer Linear Optimization with Endogenous Uncertainty. In: *SIAM Journal on Optimization*. 2022; 32, 1, pp. 292-318, 27 p., https://doi.org/10.1137/20M1355422

Braune, R., **Gutjahr, W.** & Vogl, P.: Stochastic radiotherapy appointment scheduling. In: *Central European Journal of Operations Research*. 2022; 30, 4, pp. 1239-1277, 39 p., https://doi.org/10.1007/s10100-021-00762-5

Brignone, R., **Gonzato, L.** & Lütkebohmert, E.: Efficient Quasi-Bayesian Estimation of Affine Option Pricing Models Using Risk-Neutral Cumulants. In*: Journal of Banking & Finance*. 2023; 148, https://doi.org/10.1016/j.jbankfin.2022.106745 *(online first 2022)*

Cuchiero, C., Gonon, L., Grigoryeva, L., Ortega, J-P. & Teichmann, J.: Discrete-Time Signatures and Randomness in Reservoir Computing. In: *IEEE transactions on Neural Networks and Learning Systems*. 2022; 33, 11, pp. 6321-6330, 10 p., https://doi.org/10.1109/TNNLS.2021.3076777

Gutjahr, W., **Kovacevic, R.** & Wozabal, D.: Risk-Averse Bargaining in a Stochastic Optimization Context. In: *Manufacturing & Service Operations Management: M & SOM*. 2023; 25, 1, pp. 323-340 18 p., https://doi.org/10.1287/msom.2021.1076 *(online first 2022)*

Hautsch, N., Okhrin, O. & Ristig, A.: Maximum-Likelihood Estimation Using the Zig-Zag Algorithm. In: *Journal of Financial Econometrics*. 2022; https://doi.org/10.1093/jjfinec/nbac006 *(online first)*

Keilbar, G. & Wang, W.: Modelling systemic risk using neural network quantile regression. In: *Empirical Economics: a quarterly journal of the Institute for Advanced Studies, Vienna*. 2022; 62, 1, pp. 93-118, 26 p., https://doi.org/10.1007/s00181-021-02035-1

Kramlinger, P., **Krivobokova, T.** & Sperlich, S.: Marginal and Conditional Multiple Inference for Linear Mixed Model Predictors. In: *Journal of the American Statistical Association*. 2022; 12 p., https://doi.org/10.1080/01621459.2022.2044826 *(online first)*

Krivobokova, T., Serra, P., Rosales, F. & **Klockmann, K.**: Joint Non-parametric Estimation of Mean and Auto-Covariances for Gaussian Processes. In: *Computational Statistics and Data Analysis*. 2022; 173, 17 p., https://doi.org/10.1016/j.csda.2022.107519

Jirak, J. M. & Wahl, M.: Relative perturbation bounds with applications to empirical covariance operators. In: *Advances in Mathematics*. 2023; 412, 55 p., https://doi.org/10.1016/j.aim.2022.108808 *(online first 2022)*

Mangat, M. K., **Reschenhofer, E.**, **Stark, T.** & **Zwatz, C.**: High-frequency trading with machine learning algorithms and limit order book data. In: *Data Science in Finance and Economics*. 2022; 2, 4, pp. 437-463, https://doi.org/10.3934/DSFE.2022022

Nazemi, N., Parragh, S. & **Gutjahr, W.**: Bi-objective facility location under uncertainty with an application in last-mile disaster relief. In: *Annals of Operations Research*. 2022; 319, 2, pp. 1689-1716, 27 p., https://doi.org/10.1007/s10479-021-04422-4

Parragh, S., Tricoire, F. & **Gutjahr, W.**: A branch-and-Benders-cut algorithm for a bi-objective stochastic facility location problem. In: *OR Spectrum*. 2022; 44, pp. 419-459, 41 p., https://doi.org/10.1007/s00291-020-00616-7

Pflug, G.: Multistage stochastic decision problems: Approximation by recursive structures and ambiguity modeling. In: *European Journal of Operational Research*. 2023; 306, 3, pp. 1027-1039, 13 p., https://doi.org/10.1016/j.ejor.2022.04.002 *(online first 2022)*

Pflug, G., Hochrainer, S. & Birghila, C.: Risk-layering and Optimal Insurance Uptake under Ambiguity: With an application to farmers exposed to drought risk in Austria. In: *Risk Analysis*. 2022; 42, 12, pp. 2639-2655, 17 p., https://doi.org/10.1111/risa.13884

Pötscher, B. & Preinerstorfer, D.: How Reliable are Bootstrap-based Heteroskedasticity Robust Tests? In: *Econometric Theory*. 2022; pp. 1-59, https://doi.org/10.1017/S0266466622000184 *(online first)*

Ratzenböck, S., Obermüller, V., Möller, T., Alves, J. & **Bomze, I.**: Uncover: Toward Interpretable Models for Detecting New Star Cluster Members. In*: IEEE Transactions on Visualization and Computer Graphics*. 2022; p. 1-1, 1 p., https://doi.org/10.1109/TVCG.2022.3172560 *(online first)*

Reschenhofer, E.: Adjusting for trend removal in the frequency domain. In: *Journal of Econometrics and Statistics*. 2022; 2, 2, pp. 253-266., https://doi.org/10.47509/JES.2022.v02i02.07

Reschenhofer, E.: Evaluating pairwise variable selection methods. In: *European Journal of Statistics*. 2022; 2, 11, pp. 1-15, 15 p., https://doi.org/10.28924/ada/stat.2.11

Reschenhofer, E. & Reschenhofer, B. K.: Investigating the persistence of shocks: global warming, economic growth and migration. In: *International Journal of Statistics and Applications*. 2022; 12, 2, pp. 30-41., https://doi:10.5923/j.statistics.20221202.02

Working Papers

Allan, A. L., **Cuchiero, C.**, Liu, C. & Prömel, D. J.: Model-free Portfolio Theory: A Rough Path Approach. In: *arXiv.* 2022; 48 p., https://arxiv.org/abs/2109.01843 *(preprint)*

Brignone, R., **Gonzato, L.** & Sgarra, C.: Commodity Asian Option Pricing and Simulation in a 4-Factor Model with Jump Clusters *(accepted)*

Cuchiero, C., Reisinger, C. & **Rigger, S.**: Implicit and fully discrete approximation of the supercooled Stefan problem in the presence of blow-ups. In: *arXiv*. 2022; 25 p., https://arxiv.org/abs/2206.14641 *(preprint)*

Cuchiero, C., Persio, L. D., Guida, F. & Papariello-Svaluto-Ferro, S.: Measure-valued processes for energy markets. In: *arXiv*. 2022; 38 p., https://arxiv.org/abs/2210.09331 *(preprint)*

Cuchiero, C., **Klein, I.** & **Gazzani, G.**: Risk measures under model uncertainty: a Bayesian viewpoint. In: *arXiv*. 2022; 47 p., https://arxiv.org/abs/2204.07115 *(preprint)*

Cuchiero, C., Papariello-Svaluto-Ferro, S. & **Gazzani, G.**: Signature based models: theory and calibration. In: *arXiv*. 2022; 50 p., https://doi.org/10.48550/arXiv.2207.13136 *(preprint)*

Cuchiero, C., Papariello-Svaluto-Ferro, S. & **Primavera, F.**: Universal approximation theorems for continuous functions of càdlàg paths and Lévy-type signature models. In: *arXiv*. 2022; 41 p., https://doi.org/10.48550/arXiv.2208.02293 *(preprint)*

Finocchio, G. & Schmidt-Hieber, J.: Posterior Contraction for Deep Gaussian Process Priors. In: *arXiv*. 2022, 56 p., https://arxiv.org/abs/2105.07410 *(accepted)*

Gehrig, T., Menkveld, A., **Hautsch, N.** & Westheide, C.: Non-Standard Errors. Swiss Finance Institute. 2022;

Gruber, H. & **Jirak, J. M.**: Time-varying first-order autoregressive processes with irregular innovations. In: *arXiv*. 2022; 34 p., https://arxiv.org/abs/2201.09346v2 *(preprint)*

Jirak, J. M.: A Berry-Esseen bound with (almost) sharp dependence conditions, In: Bernoulli: a journal of mathematical statistics and probability. In: *arXiv*. 2022; 27 p., https://doi.org/10.48550/arXiv.2008.07332 *(accepted)*

Louchard, G., **Schachinger, W.** & Ward, M. D.: The number of distinct adjacent pairs in geometrically distributed words: a probabilistic and combinatorial analysis. In: *arXiv*. 2022; 39 p., https://doi.org/10.48550/arXiv.2203.14773 *(submitted)*

Pötscher, B. & Preinerstorfer, D.: A Modern Gauss-Markov Theorem? Really? In: *arXiv*. 2022; 21 p., https://doi.org/10.48550/arXiv.2203.01425

Steinberger, L. & **Leeb, H.**: Conditional predictive inference for stable algorithms, In: *arXiv*. https://arxiv.org/abs/1809.01412 *(accepted)*

Steinberger, L., Rohde, A. & Butucea, C.: Interactive versus non-interactive locally differentially private estimation: Two elbows for the quadratic functional. In: *arXiv*. 2022; 79 p., https://arxiv.org/abs/2003.04773 *(accepted)*

6 Dissemination of Research

Presentations at Workshops, Conferences and Outside Seminars

	Event/Institution	Title of Presentation
Karolina Klockmann	16th International Conference on Computational and Financial Econometrics (CFE-CMStatistics 2022) 17/12/22 → 19/12/22	Fully data-driven non-parametric estimation of Toeplitz covariance matrices
Tatyana Krivobokova	CFE-CMStatistics 2022 - 15th International Conference of the ERCIM WG on Computational and Methodological Statistics 17/12/22 → 19/12/22	Efficient nonparametric estimation of Toeplitz covariance matrices
Gianluca Finocchio	CFE-CMStatistics 2022 - 15th International Conference of the ERCIM WG on Computational and Methodological Statistics 17/12/22 → 19/12/22	Iterative regularization methods for ill-posed generalized linear models
Christa Cuchiero	Verona workshop in Financial Mathematics 4/12/22	Measure-valued processes for energy markets
Christa Cuchiero	Miniworkshop in Stochastic Analysis, University of Amsterdam, Netherlands 8/12/22	Signature methods in Stochastic Portfolio Theory
Lukas Steinberger	CREST-Centre for Research in Economics and Statistics, Palais Cedex, France 8/11/22	Statistical Efficiency in Local Differential Privacy
Christa Cuchiero	Recent developments in stochastics with application in mathematical physics and finance, Tunesia 4/10/22 → 8/10/22	Measure-valued processes for energy markets
Christa Cuchiero	IFAM Seminar, Liverpool, Großbritannien 1/10/22	Signature methods in stochastic portfolio theory
Christa Cuchiero	BIRS Workshop: New interfaces of Stochastic Analysis and Rough Paths 25/9/22 → 29/9/22	Sequentially interactive versus non-interactive local differential privacy: estimating the quadratic functional

Christa Cuchiero	25th International Symposium on Mathematical Theory of Networks and Systems (MTNS 2022), Universität Bayreuth, Germany 12/9/22 → 16/9/22	Signature based models in finance: relation to affine and polynomial processes, calibration and inclusion of jumps
Christa Cuchiero	Stochastic Control and Quantitative Finance Seminar, Jerusalem, Israel 10/9/22 → 14/9/22	Signature methods in stochastic portfolio theory
Christa Cuchiero	Third symposium on Machine learning and Dynamical Systems, Toronto, Canada 10/09/22	Universal approximation theorems for continuous functions of càdlàg paths and Lévy-type signature models
Christa Cuchiero	10th Austrian stochastic days, Vienna, Austria 8/9/22 → 9/9/22	Signature methods in stochastic portfolio theory
Nicolai Amann	17. Doktorand:innentreffen der Stochastik 3/08/22 → 5/08/22	Conditional predictive inference for linear sub-models of high-dimensional data
Christa Cuchiero	Stochastic and Rough analysis conference, TU Berlin, Germany 21/08/22 → 26/08/22	Universal approximation theorems for continuous functions of càdlàg paths and Lévy-type signature models
Christa Cuchiero	Financial Mathematics session at AMS-Ems-SMF International meeting, Grenoble, France 20/7/22 → 22/07/22	Signature methods in stochastic portfolio theory
Gianluca Finocchio	ISBA 2022- World meeting: 16th World Meeting of the International Society for Bayesian Analysis, Quebec, Canada 26/6/22 → 1/7/22	Posterior contraction for deep Gaussian process priors
Christa Cuchiero	Advances in Mathematical Finance, Pisa, Italy 27/6/22 → 30/6/22	Advances in Mathematical Finance and Optimal Transport
Karolina Klockmann	ISNPS 2022- International Symposium on Nonparametric Statistics, Cyprus, Greece 22/06/22	Fully data-driven non-parametric estimation of Toeplitz covariance matrices
Johannes Moritz Jirak	ISNPS 2022- International Symposium on Nonparametric Statistics, Cyprus, Greece 21/06/22	Relative perturbation bounds with applications to empirical covariance operators

Tatyana Krivobokova	ISNPS 2022- International Symposium on Nonparametric Statistics, Cyprus, Greece 20/06/22	Joint non-parametric estimation of mean and auto-covariances for Gaussian processes
Johannes Moritz Jirak	EcoSta 2022: 5th international Conference on Econometrics and Statistics, Tokyo, Japan 4/6/22 → 6/6/22	Session ”Empirical covariance operators and beyond”
Christa Cuchiero	Minisymposium in LMU, Germany 3/6/22	Signature methods in stochastic portfolio theory
Johannes Moritz Jirak	Guest presentation at the Institute for Statistics, TU Graz, Austria 12/5/22	Relative perturbation bounds with applications to empirical covariance operators
Tatyana Krivobokova	Seminaire Probabilites, Statistique et Applications, LMA, Université de Poitiers, France 5/5/22	Efficient non-parametric estimation of Toeplitz covariance matrices
Christa Cuchiero	Algorithmic Trading Group Seminar, USA, United States of America May 2022	Universal portfolios and model-free portfolio optimization
Christa Cuchiero	Quantact Seminar, Montreal, Canada May 2022	Optimal bailout strategies and the drift-controlled supercooled Stefan problem
Christa Cuchiero	IMSI Workshop on Machine Learning and Mean-Field Games (Online), Chicago, USA May 2022	Optimal bailout strategies and the drift-controlled supercooled Stefan problem
Christa Cuchiero	On the interplay between Finance and Insurance Mathematics, Lisbon, Portugal May 2022	Measure-valued processes for energy markets
Lukas Steinberger	Forschungsverbund Data Science, Vienna, Austria 29/4/22	Statistically optimal estimation with local differential privacy
Christa Cuchiero	Spring Colloquium on Probability and Finance dedicated to Wolfgang Runggaldier on the occasion of his 80th birthday, Padova, Italy 28/4/22 → 29/4/22	Optimal bailout strategies and the drift-controlled supercooled Stefan problem
Tatyana Krivobokova	DASHH Data Science Seminar, Hamburg, Germany 21/04/22	Statistical Challenges in Protein Dynamics Modelling

Christa Cuchiero	Columbia Mathematical Finance Seminar, New York, USA 14/4/22	Optimal bailout strategies and the drift-controlled supercooled Stefan problem
Christa Cuchiero	XXIII Quantative Finance Workshop, University of Rome, Italy 30/3/22 → 1/4/22	Measure-valued processes for energy market
Christa Cuchiero	Manchester Probability Seminar, Großbritannien 17/3/22	Optimal bailout strategies and the drift-controlled supercooled Stefan problem
Christa Cuchiero	DNA Seminar-Norwegian University of Science and Technology (Online) March 2022.	Randomized signature for approximation of dynamic processes
Christa Cuchiero	13th international Workshop on Stochastic Models and Control, Travemünde, Germany 14/3/22 → 18/3/22	Optimal bailout strategies and the drift-controlled supercooled Stefan problem
Christa Cuchiero	BIRS Workshop: Stochastic Mass Transports, Canada March 2022	Measure-valued processes for energy markets
Christa Cuchiero	Cournot Seminar: From Microscopic Models to Rough Macroscopic Models, Cournot, France 8/2/22	Rough covariance modeling - theory and empirics
Christa Cuchiero	Winter Seminar on Mathematical Finance, Netherlands 6/01/22	Signature SDEs as affine and polynomial Processes

Departmental Seminar (ISOR Colloquium)

January 10	Gregor Kastner University Klagenfurt, Austria	Posterior predictive model checking using formal methods in a spatio-temporal model (webinar)
March 14	Johannes Heiny Ruhr University Bochum, Germany	Recent advances in large sample correlation matrices and their applications (on site and webinar)
April 4	Johannes Schmidt-Hieber University of Twente, Netherlands	Overparametrization and the bias-variance dilemma (on site and webinar)
April 25	Simon Hochgerner FMA - Austrian Financial Market Authority, Austria	Mean-field LIBOR market models and valuation of long term guarantees (on site and webinar)

May 2	Eftychia Solea CREST and ENSAI, France	High-dimensional nonparametric functional graphical models via the additive partial correlation operator (on site and webinar)
May 9	Victor M. Panaretos Ecole Polytechnique Fédérale de Lausanne, Switzerland	The completion of Covariance Kernels (on site and webinar)
May 16	Michael Vogt Ulm University, Germany	Estimating the lasso's effective noise (on site and webinar)
May 25	Rainer von Sachs Université catholique de Louvain, Belgium	Statistical inference for intrinsic wavelet estimators of covariance matrices in a log-Euclidean manifold (on site and webinar)
May 30	Valentin Patilea CREST and ENSAI, France	Learning the regularity of curves in functional data analysis and applications (on site and webinar)
June 13	Christian Bayer Weierstraß Institute for Applied Analysis and Stochastics, Germany	Optimal stopping with signatures (on site and webinar)
June 20	Harald Oberhauser University of Oxford, United Kingdom	Learning laws of Stochastic Processes (on site and webinar)
October 3	Axel Munk Georg-Ausgust-University Göttingen, Germany	Optimal Transport-based Data Analysis: Inference, Algorithms, Applications (on site and webinar)
October 10	Richard J. Samworth University of Cambridge, United Kingdom	Optimal nonparametric testing of Missing Completely At Random, and its connections to compatibility (on site and webinar)
October 17	François Portier CREST and ENSAI, France	On the weak convergence of the Nearest neighbor process (on site and webinar)
October 24	Olivier Wintenberger Sorbonne Université, France	Multivariate Sparse Clustering for Extremes (on site and webinar)
November 14	Mathias Trabs Karlsruhe Institute of Technology, Germany	MCMC-based Bayesian neural networks: Algorithmic and theoretical challenges (on site and webinar)
November 21	Mark Podolskij Université du Luxembourg, Luxembourg	Semiparametric estimation of McKean-Vlasov SDEs (on site and webinar)
November 28	Matteo Lapucci Università degli Studi di Firenze, Italy	Inexact Penalty Decomposition Methods for Optimization Problems with Geometric Constraints (on site and webinar)

December 5	Dominik Liebl University of Bonn, Germany	Fast and Fair Simultaneous Confidence Bands for Functional Parameters (on site and webinar)
December 12	Botond Tibor Szabo Bocconi University Milan, Italy	Optimal distributed testing under communication constraints in high-dimensional and nonparamteric Gaussian white noise model (on site and webinar)

7 Grants and Externally Funded Research Projects

Nikolaus Hautsch (Principal Investigator)	Title: AIROW – Artificial Intelligence in Rowing Funding: Bundesministerium für Kunst, Kultur, öffentlicher Dienst und Sport Funding period: 2023-2026
Christa Cuchiero (Project-Coordinator) Research Associates: **Benedict Bauer,** Florian Huber, **Janka Möller, Francesca Primavera, Stefan Rigger, Sara-Svaluto-Ferro**	Title: Polynomial Volterra Processes and their Applications in Finance Funding: OeAD Funding period: 2022-2023
Lukas Steinberger (Principal Investigator) (joint project with Angelika Rohde)	Title: Classification – Preprocessed and High-Dimensional Data Sets Funding: DFG/FWF Funding period: 2021-2025
Nikolaus Hautsch (Principal Investigator) Research Associate: **Yuan Chen**	Title: Econometrics of Systemic Risk: Inference, Model Comparison and Network Dependencies Funding: Jubiläumsfonds OeNB Funding Period: 2021-2025
Moritz Jirak (Principal Investigator), Alexander Meister (Principal Investigator)	Title: Supersmooth functional data analysis and PCA-preprocessing Funding: DFG/FWF Funding period: 2021-2024
Christa Cuchiero (Project-Coordinator) Research Associates: **Benedict Bauer**, Florian Huber, **Janka Möller**, **Francesca Primavera**, **Stefan Rigger**, **Sara-Svaluto-Ferro**	Title: Universal structures in Mathematical Finance Funding: FWF, 2019 START – Prize Funding period: 2020-2026
Nikolaus Hautsch (Principal Investigator) Research Associate: **Ilya Archakov**	Title: Econometrics of Central Counterpart Risk Management Funding: FWF Funding period: 2020-2023
Radu Ioan Bot (Principal Investigator) **Immanuel Bomze** (Co-Investigator),	Title: VGSCO: Vienna Graduate School on Computational Optimization (2nd Funding period)

Monika Henzinger (Co-Investigator), Arnold Neumaier (Co-Investigator)	Funding: FWF Funding period: 2020-2024
Karl Franz Dörner (Project-Coordinator) **Immanuel Bomze** (Co-Investigator) Radu Ioan Bot (Co-Investigator) Sylvia Kritzinger (Co-Investigator) Research Associates: **Michael Kahr**, Michael Sedlmayer, David Wolfinger	Title: Logistics decision support in the pandemic Funding: FWF Funding period: 2020-2022
Christa Cuchiero (Project-Coordinator), **Irene Klein** (Co-Investigator), Thorsten Schmidt (Co-Investigator) Research Associates: **Guido Gazzani**	Title: Dynamic Uncertainty Modeling in Finance Funding: 2018 DFG-FWF-Project Funding period: 2019-2022
Nikolaus Hautsch (Principal Investigator)	Title: Vienna Graduate School of Finance Funding: doc.funds, FWF Funding period: 2018-2022

8 Research Stays at Other Institutions

	Institution	**Weeks**
Immanuel Bomze	EURO 2022 Conference, Espoo, Finland	01.07.2022 - 07.07.2022
Immanuel Bomze	Conference of the International Federation of Classification Societies, Porto, Portugal	19.7.2022 - 23.7.2022
Immanuel Bomze	EurOpt 2022 (Workshop), Nova School of Science and Technology, Caparica, Portugal	31.07.2022- 01.08.2022
Immanuel Bomze	International Conference on Optimization and Decision Science, Florence, Italy	29.08.2022 - 03.09.2022
Immanuel Bomze	ParaOpt XII 2022 (Conference), Augsburg, Germany	11.09.2022- 16.09.2022
Immanuel Bomze	Workshop and PhD-Committee, University Nova Lisboa, Portugal	07.12.2022 - 09.12.2022
Christa Cuchiero	Research topic: Signature SDEs, ETH Zürich, Switzerland	21.12.2022 - 23.12.2022
Christa Cuchiero	Research topic: HC AMADEUS project “Polynomial Volterra processes and their applications in finance”, Laboratoire de Mathematiques et Modelisation d’’Evry (LaMME), France	19.12.2022 - 20.12.2022
Tatyana Krivobokova	Participation in “22nd edition of the conference Mathematical Methods of Statistics”, CIRM – Centre	12.12.2022 - 16.12.2022

	International de recontres Mathématiques, Marseille, France	
Christa Cuchiero	Research topic: Signature SDEs and joint VIX/SPX calibration with signature based models, University of Verona, Italy	08.12.2022 - 16.12.2022
Christa Cuchiero	Research topic: Randomized signature / Global universal approximation of functional input maps on weighted spaces, NTU, Singapore	13.11.2022 - 20.11.2022
Lukas Steinberger	Invited teaching stay, ENSAE CREST - Center for Research in Economics and Statistics, Palaiseau, France	07.11.2022 - 17.11.2022
Karolina Klockmann	Invited research stay, ENSAE CREST - Center for Research in Economics and Statistics, Palaiseau, France	06.11.2022 - 01.12.2022
Nicolai Amann	Research group meeting DFG research unit 5381 “Mathematical Statistics in the Information Age – Statistical Efficiency and Computational Tractability”, Rostock, Germany	22.09.2022 - 24.09.2022
Johannes Moritz Jirak	Research group meeting DFG research unit 5381 “Mathematical Statistics in the Information Age – Statistical Efficiency and Computational Tractability”, Rostock, Germany	21.09.2022 - 24.09.2022
Georg Köstenberger	Research group meeting DFG research unit 5381 “Mathematical Statistics in the Information Age – Statistical Efficiency and Computational Tractability”, Rostock, Germany	21.09.2022 - 24.09.2022
Johannes Moritz Jirak	Participation in workshop on “Bootstrap for time series: theory and applications”, TU Braunschweig, Institut für Mathematische Stochastik, Braunschweig, Germany	07.09.2022 - 09.09.2022
Karolina Klockmann	Participation in “Summer school on modern topics in time series analysis”, Klagenfurt, Austria	12.09.2022 - 16.09.2022
Georg Köstenberger	Participation in “Summer school on modern topics in time series analysis”, Klagenfurt, Austria	12.09.2022 - 16.09.2022
Christa Cuchiero	Guest lecturer, Università degli Studi di Padova, Italy	Sept. 2022
Christa Cuchiero	Research topic: Signature SDEs, ETH Zürich, Switzerland	02.06.2022 - 03.06.2022
Tatyana Krivobokova	Invited research stay, ENSAE CREST - Center for Research in Economics and Statistics, Palaiseau, France	22.04.2022 - 04.05.2022

9 Other Faculty Activities

Editorial Work

Immanuel Bomze

Editor-in-Chief
- EURO Journal on Computational Optimization

Member of Editorial Board
- Advances in Data Analysis and Classification
- Central European Journal of Operations Research
- European Journal of Operational Research
- Journal of Global Optimization
- Operations Research Perspectives
- Optimization Letters

Christa Cuchiero

Guest Editor
- Special Issue “Machine Learning in Finance” of Mathematical Finance

Associate Editor
- SIAM Journal on Financial Mathematics
- Frontiers of Mathematical Finance
- Stochastics
- Mathematical Finance
- Journal of Computational Finance
- Finance and Stochastics

Walter J. Gutjahr

Department Editor
- OR Spectrum

Associate Editor
- Central European Journal of Operations Research

Member of Editorial Review Board
- Production and Operations Management

Member of Editorial Board
- EURO Journal on Decision Processes

Nikolaus Hautsch

Associate Editor
- Journal of Applied Econometrics
- Journal of Business and Economic Statistics
- International Journal of Forecasting
- Market Microstructure and Liquidity
- Journal of Financial Econometrics

Editorial Board
- Econometrics

Managing Editor
- Quantitative Finance

Johannes Moritz Jirak	Associate Editor ▪ Statistical Inference for Stochastic Processes (SISP)
Tatyana Krivobokova	Associate Editor ▪ Journal of the American Statistical Association ▪ Metrika
Hannes Leeb	Associate Editor: ▪ Sankhya
Benedikt M. Pötscher	Associate Editor ▪ Journal of Statistical Planning and Inference Co-Editor ▪ Econometric Theory Guest Editor, joint with L. Soegner and M. Wagner: ▪ Special issue of Econometrics: "High-Dimensional Time Series in Macroeconomics and Finance – A Tribute to Manfred Deistler"
Lukas Steinberger	Associate Editor ▪ Statistical Papers

Refereeing

Christa Cuchiero	▪ Annals of Applied Probability ▪ Electronic Journal of Probability ▪ Finance and Stochastics ▪ Mathematical Finance: An International Journal of Mathematics, Statistics and Financial Economics ▪ SIAM Journal on Financial Mathematics ▪ Statistics & Probability Letters ▪ Stochastic Processes and their Applications
Nikolaus Hautsch	▪ Deutsche Forschungsgemeinschaft (1) ▪ Econometrics (1) ▪ Journal of Applied Econometrics (5) ▪ Journal of Econometrics (2) ▪ Journal of the American Statistical Association (1) ▪ Journal of Financial and Quantitative Analysis (1) ▪ OeNB Jubiläumsfonds (1)
Florian Huber	▪ Stochastic Processes and their Applications
Irene Klein	▪ Finance and Stochastics (1)
Tatyana Krivobokova	▪ Biometrika (1) ▪ Journal of Multivariate Analysis (1) ▪ Journal of the Royal Statistical Society, Series C (1) ▪ Sankhya A (1)

Hannes Leeb	▪ Annals of Applied Statistics (1) ▪ Biometrika (2) ▪ Statistical Papers (1)
Benedikt M. Pötscher	▪ Econometric Theory
Werner Schachinger	▪ Journal of Combinatorial Theory, Series A
Lukas Steinberger	▪ Annals of Statistics (3) ▪ Statistical Papers (1) ▪ Statistica Sinica (1)

Public Relations Activities

Christa Cuchiero	▪ Lea Kinderbuch Projekt

Other Professional Activities

Immanuel Bomze	▪ Board Member of Research Network Data Science, Univ. Vienna, Austria ▪ Board Member of Research Platform Governance of digital practices, Univ. Vienna, Austria ▪ Vice Director of Studies - PhD Statistics and Operations Research, Univ. Vienna, Austria (until Oct 22)
Christa Cuchiero	▪ Vice Director of Studies - PhD Statistics and Operations Research, Univ. Vienna, Austria (Oct 22.-Sept. 24) ▪ Executive board member of the research network Data Science @ Uni Vienna (Oct 22-) ▪ External member of hiring committees: Full professor in Probability and Statistics at the Institut Élie Cartan of the University of Lorraine in Nancy, 2022 ▪ Internal member of hiring committees: Full professorship in Optimization (2022)
Nikolaus Hautsch	▪ Board Member of Research Network Data Science, Univ. Vienna, Austria ▪ Vice Rector for Infrastructure, Univ. Vienna, Austria, since 1.10.2022
Johannes Moritz Jirak	▪ Head of Department (Oct 2022-Sept 2024)
Irene Klein	▪ Vice Director of Studies - Statistics, Univ. Vienna, Austria (Oct 2022–Sept 2024) ▪ Internal member of hiring committees: Full professorship in Optimization (2022)

Tatyana Krivobokova	▪ Board Member of Research Network Data Science, Univ. Vienna, Austria ▪ Vice Dean Research and International Affairs of Faculty of Business, Economics and Statistics, Univ. Vienna (01.10.2022-30.09.2024) ▪ Member of the IMS committee on Equality and Diversity, Institute of Mathematical Statistics, USA (2020-2023) ▪ Internal member of hiring committees: Tenure track professorship in Mathematical Methods for Data Science (2022) Tenure track professorship in Prescriptive Business Analytics (2022)
Hannes Leeb	▪ Board Member of Research Network Data Science, Univ. Vienna, Austria ▪ Vice Dean Research and International Affairs of Faculty of Business, Economics and Statistics, Univ. Vienna, Austria (until Oct 2022) ▪ Member of decision-making committee for the ÖMG-study award ▪ Internal member of hiring committees: Full professorship in Optimization (2022)
Benedikt M. Pötscher	▪ Head of Department (until Oct 2022) ▪ Co-Organizer of "5th Vienna Workshop on High-dimensional Time Series in Macroeconomics and Finance - A tribute to Manfred Deistler"
Werner Schachinger	▪ Vice Director of Studies - Statistics, Univ. Vienna, Austria (until Oct 2022) ▪ Internal member of hiring committees: Full professorship in Optimization (2022)
Lukas Steinberger	▪ Board Member of Research Network Data Science, Univ. Vienna, Austria ▪ Head of Admissions Board for Master Studies in Data Science, Univ. Vienna, Austria