



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



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ANNUAL REPORT 2019

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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 2019. 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.

In 2019, Lukas Steinberger joined on a tenure-track position. Also, Nicolai Amann and Thomas Stark joined the department as Pre doc assistants and Ali Divsalar as Post doc assistant for a two-month duration.

There were also several departures in 2019: Georg Pflug retired after many years at our department. We are very grateful to him for his many contributions and wish him well in his retirement. Corina Birghila, Debora Daniela Escobar and Martin Glanzer successfully defended their thesis and graduated from the PhD Programme in Statistics and Operations Research. Markus Leitner left for a Professor position at Vrije Universiteit Amsterdam and Kory Johnson for a research associate position at WU Vienna. Georg Brandstätter and Michael Kahr left the department on expiry of their supporting grant. Lisa Carli moved to a new position in the Dean's office. Jürgen Berlakovich and Gerald Kamhuber decided to pursue other career options. We wish them all well in their new endeavours.

I am also pleased to announce that Nikolai Amann has been awarded the Förderpreis der Österreichischen Statistischen Gesellschaft in the category Theoretical Statistics for his Master thesis „Asymptotic confidence regions based on the adaptive LASSO with partial consistent tuning“.

I would like to express special thanks to Julia Brandstätter and Vera Lehmwald for editing the Annual Report 2019.

Benedikt Pötscher

(Head of Department)

Vienna, September 2020

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
Ali Divsalar (PhD)	
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
Kory Johnson (PhD)	Feature selection, Post-selection inference, Fairness, Accountability, and Transparency in Machine Learning (FATML)
Irene Klein (Assoc. Prof.)	Stochastic Finance
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
Markus Leitner (Dr.)	Operations Research, Combinatorial Optimization
Ivana Ljubic (Ass. Prof., on leave)	Algorithmic Operations Research, Algorithm Engineering
Georg Pflug (Prof.)	Mathematical Statistics, Stochastic Optimization, Risk Management
Mathias Pohl (PhD)	Dependence modeling and Copulas, High Frequency Trading, Model Ambiguity, Optimal Transport, Portfolio Optimization, Robust Optimization
Benedikt Pötscher (Prof.)	Econometrics, Statistics, Time Series Analysis
Erhard Reschenhofer (Assoc. Prof.)	Time Series Analysis, Financial Econometrics, Automatic Model Selection
Mario Ruthmair (Dr.)	Operations Research, Combinatorial Optimization, (Mixed) Integer Linear Programming, Optimization in Network Design, Transport and Logistics

Teresa Scarinci (PhD)	Optimal control of ODEs (Sensitivity analysis, Optimality conditions, Numerical approximation of solutions of problems with constraints), Nonsmooth analysis and Variational inequalities, Numerical analysis in optimization and optimal controls, Hamilton-Jacobi-Bellman equations
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
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PhD Students

Nicolai Amann (Dipl.-Ing.)	Predictive Inference & Model Selection in High-Dimensional Linear Models
Corina Birghila (MSc)	Extreme Value Theory, Insurance Pricing
Georg Brandstätter (Dipl.-Ing.)	Combinatorial Optimization, Integer Linear Programming, Transportation and Logistics Optimization
Daniela Escobar (MSc)	Linear and Non-Linear Time Series Analysis, Risk Management, Application in Energy Markets
Markus Gabl (MSc)	Copositive Optimization, Quadratic Optimization, Conic Optimization, Robust Optimization
Caroline Geiersbach (Dipl.-Ing.)	Optimal control of PDEs, Stochastic Optimization, Shape Optimization, Multiscale Methods, Numerical Methods
Martin Glanzer (Dipl.-Ing.)	Stochastic optimization and Quantitative Finance
Sándor Guzmics (MSc)	Stochastic Optimization, Financial Mathematics, Systemic Risk in Financial Systems
Michael Kahr (MSc)	(Mixed) Integer Linear Programming, Stochastic and Robust Optimization, Conic Optimization, Network Optimization
Danijel Kivaranovic (Mag.)	Inference post-model-selection, Predictive inference with machine learning algorithms
Manveer Mangat (MSc)	Times Series Analysis, Financial Econometrics

Thomas Stark (Mag.)

Time Series Analysis, Financial Econometrics

Christian Zwatz (Mag.)

Autocorrelation Robust Testing, Spatial Econometrics

External Lecturers (Academic Year 2018/2019)

Andreas Baierl (University of Vienna), Johann Brandstetter (University of Vienna), Florian Frommlet (MedUni Vienna), Evelina Erlacher (University of Vienna), Annemarie Grass (University of Vienna), Wilfried Grossmann (University of Vienna), Sándor Guzmics (University of Vienna), Moshe Haviv (Hebrew University of Jerusalem), Georg Heinze (MedUni Vienna), Marcus Hudec (University of Vienna), Raimund Kovacevic (TU Vienna), Christoph Krall (University of Vienna), Ivana Milovic (University of Vienna), Nysret Musliu (TU Vienna), Herbert Nagel (University of Vienna), Robin Ristl (University of Vienna), Clemens Sauerzopf (Data Technology), Theresa Scharl-Hirsch (BOKU Vienna), Leopold Sögner (IHS Vienna), Gerhard Svolba (SAS), Alexander Tichy (VetMedUni Vienna), Anna Timonina-Farkas (EPFL, Switzerland), Gabriele Uchida (University of Vienna), Claus Vogl (VetMedUni Vienna), Bertram Wassermann (University of Vienna)

Teaching Assistants (Academic Year 2018/2019)

Manuel Hahn, Azadeh Sadat Mirtaheri, Michael Raffelsberger, Stefan Ortner, Thomas Stark

Administrative Assistants

Julia Brandstätter, Lisa Carli, Birgit Ewald, Vera Lehmwald, Manuela Nicham-Zorn

System Administrators

Jürgen Berlakovic, Stefan Geißler, Rolf Karner, Andreas Loibl, Martin Marktl, Svetlana Mihajlovic

3 Visitors

Peter R. Hansen (Univ. North Carolina, Chapel Hill, USA), Stephan Eckstein (Univ. Konstanz, Germany)

4 Teaching

Theses Supervised

PhD Theses in Progress

Supervisor	Author	Title
Immanuel Bomze	Philipp Hungerländer (Alpen-Adria-Universität Klagenfurt, Austria)	Extensions of the Traveling Salesman Problem
Immanuel Bomze	Markus Gabl	A copositive approach to adjustable robust optimization with uncertain recourse
Immanuel Bomze, João Alves, Torsten Möller (all Research Platform "Data Science@Uni Vienna")	Sebastian Ratzenböck	Machine learning tools for detection of stellar clusters
Nikolaus Hautsch	Xandro Bayer	
Hannes Leeb	Nicolai Amann	Conditional predictive inference for linear sub-models of high-dimensional data
Hannes Leeb	Danijel Kivaranovic	Statistical analysis and development of inference procedures post-model-selection
Markus Leitner, Ivana Ljubic	Georg Brandstätter	Strategic Optimization of Electric Car Sharing Systems
Markus Leitner, Immanuel Bomze	Michael Kahr	On influence propagation and community detection problems in quantitative social network analysis
Georg Pflug	Caroline Geiersbach	Stochastic Approximation for PDE-Constrained Optimization under Uncertainty
Georg Pflug	Sandor Guzmics	Freund copula and extensions
Benedikt M. Pötscher	Christian Zwatz	Topics in Autocorrelation Robust Testing and Spatial Models
Erhard Reschenhofer	Manveer K. Mangat	Essays on time series forecasting
Erhard Reschenhofer	Thomas Stark	Essays on stock return and volatility forecasting

PhD Theses Finished

Supervisor	Author	Title
Nikolaus Hautsch	Stefan Voigt (VGSF)	
Georg Pflug	Corina Birghila	Insurance contract under ambiguity
Georg Pflug	Debora Daniela Escobar	Robust pricing in insurance and energy markets
Georg Pflug	Martin Glanzer	Multistage Stochastic and Distributionally Robust Optimization

Master Theses in Progress

Supervisor	Author	Title
Immanuel Bomze	Cornelia Pollack	The analysis of passenger behaviour in the Austrian railway system (ÖBB)
Immanuel Bomze	Sandra Ines Peer	Extended trust region problem and their copositive relaxation: a simulation study
Nikolaus Hautsch	Dilshod Agishev	Testing for predictability in crypto-currencies
Nikolaus Hautsch	Yelena Holzer	
Nikolaus Hautsch	Bogdan Stankovski	The Effect of CEO Departures on Stock Returns
Nikolaus Hautsch	Zhuxi Pang	Will the outbreak of Coronavirus disease (COVID-19) affect the stock markets of infected countries?
Irene Klein	Azadeh Sadat Mirtaheri	
Hannes Leeb	Manuel Hahn	An analysis of a proposed model-free approach to linear least squares regression
Hannes Leeb	Manuel Mueller	The convergence rate of stochastic gradient descent
Hannes Leeb	Mathias Woerndl	Controlling the false discovery rate with knockoffs
Erhard Reschenhofer	Patrycja Pultowicz	Application of machine learning algorithms to stock price movement
Erhard Reschenhofer	Christian Url	Distribution-free predictive intervals for quantile forests

Erhard Reschenhofer	Alexander Leo Kuhn	Comparing Classes of Volatility Models
Erhard Reschenhofer	Melanie Nachreiner	Bitcoin: Eine Wechselkursanalyse
Erhard Reschenhofer	Xaver-Paul Stadlbauer	Anomaliedetektion zur Überwachung von Photovoltaikanlagen
Werner Schachinger	Simon Klima	Random Graphs and the Giant Component
Werner Schachinger	Rafael Jochum	Verzweigungsprozesse – Theorie und Anwendung

Master Theses Finished

Supervisor	Author	Title
Walter Gutjahr	Denisa Vlcekova	Equity and Deprivation Costs in Humanitarian Logistics by Gradient Search
Georg Pflug	Vito Satrapa	Neue eindimensionale Wahrscheinlichkeitsverteilungen
Erhard Reschenhofer	Claudia Amon	Prediction of stock return volatility
Erhard Reschenhofer	Björn Haist	Modellierung und Prognose der Fluggastzahlen am Flughafen Frankfurt am Main
Erhard Reschenhofer	Thomas Stark	Evaluating volatility forecasts using different proxies

Bachelor Theses

Immanuel Bomze (4), Nikolaus Hautsch (1), Mathias Pohl (3), Werner Schachinger (1)

5 Publications

Journal Articles

Amaral, Paula Alexandra; Bomze, Immanuel: Nonconvex min–max fractional quadratic problems under quadratic constraints: copositive relaxations. In: Journal of Global Optimization. 2019; 75, 2, pp. 227–245

Bachoc, Francois; Leeb, Hannes; Pötscher, Benedikt: Valid Confidence Intervals for Post-Model-Selection Predictors. In: Annals of Statistics. 2019; 47, 3, pp. 1475-1504

Bibinger, Markus; Hautsch, Nikolaus; Malec, Peter; Reiss, Markus: Estimating the Spot Covariation of Asset Prices - Statistical Theory and Empirical Evidence. In: Journal of Business and Economic Statistics. 2019; 37, 3, pp. 419-435

- Birghila, Corina; Pflug, Georg: Optimal XL-insurance under Wasserstein-type ambiguity. In: *Mathematics and Economics*. 2019; 88, pp. 30-43
- Bomze, Immanuel; Mertikopoulos, Panayotis; Schachinger, Werner; Staudigl, Mathias: Hessian barrier algorithms for linearly constrained optimization problems. In: *SIAM Journal on Optimization*. 2019; 29, 3, pp. 2100–2127
- Bomze, Immanuel; Rinaldi, Francesco; Rota Bulò, Samuel: Pure infection - immunization dynamics for partnership games: A correction. In: *Games and Economic Behavior*. 2019; 114, pp. 315-317
- Bomze, Immanuel; Rinaldi, Francesco & Rota Bulò, Samuel: First-order methods for the impatient: support identification in finite time with convergent Frank-Wolfe variants. In: *SIAM Journal on Optimization*. 2019; 29, 3, pp. 2211-2226
- Bomze, Immanuel; Cheng, Jianqiang; Dickinson, Peter J. C.; Lissner, Abdel; Liu, Jia: Notoriously hard (mixed-)binary QPs: empirical evidence on new completely positive approaches. In: *Computational Management Science*. 2019; 16, 4, pp. 593-619
- Bomze, Immanuel; Schachinger, Werner: Constructing Patterns of (Many) ESSs Under Support SizeControl. In: *Dynamic Games and Applications*. 2019; pp. 1-23
- Chudy, Marek; Reschenhofer, Erhard: Macroeconomic forecasting with factor-augmented adjusted band regression. In: *Econometrics*. 2019; 7, 4, pp. 1-14
- Felberbauer, Thomas; Gutjahr, Walter; Doerner, Karl F.: Stochastic project management: multiple projects with multi-skilled human resources. In: *Journal of Scheduling*. 2019, 22, pp. 271–288
- Geiersbach, Caroline; Pflug, Georg: Projected Stochastic Gradients for Convex Constrained Problems in Hilbert Spaces. In: *SIAM Journal on Optimization*. 2019; 29, 3, pp. 2079-2099
- Glanzer, Martin; Pflug, Georg; Pichler, Alois: Incorporating statistical model error into the calculation of acceptability prices of contingent claims. In: *Mathematical Programming*. 2019; 174, 1, pp. 499-524
- Glanzer, Martin; Pflug, Georg: Multiscale stochastic optimization. In: *Computational Optimization and Applications*. 2019; 75, pp. 1-34
- Gouveia, Luís; Leitner, Markus; Ruthmair, Mario: Layered graph approaches for combinatorial optimization problems. In: *Computers & Operations Research*. 2019; 102, pp. 22-38
- Gutjahr, Walter; Pichler, Alois: Uncertainty, economics and optimization: recent developments. In: *Computational Management Science*. 2019; 16, 4, pp. 541-543
- Guzmics, Sándor; Pflug, Georg: Modelling cascading effects for systemic risk: Properties of the Freund copula. In: *Dependence Modeling*. 2019; 7, 1, pp. 24-44
- Hautsch, Nikolaus; Horvath, Akos: How Effective Are Trading Pauses? In: *Journal of Financial Economics*. 2019; 131, 2, pp. 378-403
- Hautsch, Nikolaus; Voigt, Stefan: Large-Scale Portfolio Allocation Under Transaction Costs and Model Uncertainty. In: *Journal of Econometrics*. 2019; 212, pp 221-240

- Hautsch, Nikolaus; Herrera Leiva, Rodrigo: Multivariate Dynamic Intensity Peaks-Over-Threshold Models. In: *Journal of Applied Econometrics*. 2019; 35, 2, pp. 248-272
- Hochrainer, Stefan; Pflug, Georg; Colon, Célian; Poledna, Sebastian; Boza, Gergely; Linnerooth-Bayer, Joanne; Brännström, Ake: Measuring, modeling and managing systemic risk: The missing aspect of human agency. In: *Journal of Risk Research*. 2019
- Leeb, Hannes; Pötscher, Benedikt; Kivaranovic, Danijel: Discussion on "Model Confidence Bounds for Variable Selection" by Yang Li, Yuetian Luo, Davide Ferrari, Xiaonan Hu, and Yichen Qin. In: *Biometrics*. 2019; 75, 2, pp. 407-410
- Leitner, Markus; Ljubic, Ivana; Riedler, Martin; Ruthmair, Mario: Exact Approaches for Network Design Problems with Relays. In: *INFORMS Journal on Computing*. 2019; 31, 1, pp. 171-192
- Maggioni, Francesca; Pflug, Georg: Guaranteed Bounds for General Non-Discrete Multistage Risk-Averse Stochastic Optimization Programs. In: *SIAM Journal on Optimization*. 2019; 29, 1, pp. 454-483
- Mangat, Manveer; Reschenhofer, Erhard: Testing for long-range dependence in financial time series. In: *Central European Journal of Economic Modelling and Econometrics*. 2019; 11, 2, pp. 93-106
- Mostajabdaveh, Mahdi; Gutjahr, Walter; Salman, Sibel: Inequity-averse shelter location for disaster preparedness. In: *IIE Transactions*. 2019, 51, 8, pp. 809-829
- Pflug, Georg; Maier, Sebastian; Polak, John W.: Valuing Portfolios of Interdependent Real Options under Exogenous and Endogenous Uncertainties. In: *European Journal of Operational Research*. 2019; 285, 1, pp. 133-147
- Pflug, Georg; Guzmics, Sandor: Modeling cascading effects for systemic risk: properties of the Freund copula. In: *Dependence Modeling*. 2019; 7, 1
- Pötscher, Benedikt; Preinerstorfer, David: Further Results on Size and Power of Heteroskedasticity and Autocorrelation Robust Tests, with an Application to Trend Testing. In: *Electronic Journal of Statistics*. 2019; 13, 2, pp. 3893-3942
- Preininger, Jakob; Scarinci, Teresa; Veliov, Vladimir M.: Metric Regularity Properties in Bang-Bang Type Linear-Quadratic Optimal Control Problems. In: *Set-Valued and Variational Analysis*. 2019; 27, 2, pp. 381-404
- Reschenhofer, Erhard; Stark, Thomas: Forecasting the yield curve with dynamic factors. In: *Romanian Journal of Economic Forecasting*. 2019; XXII, pp. 115-129
- Reschenhofer, Erhard: Heteroscedasticity-robust estimation of autocorrelation. In: *Communications in Statistics: Simulation and Computation*. 2019; 48, 4, pp. 1251-1263
- Schopf, Christiane; Raso, Andrea; Kahr, Michael: How to give effective explanations: guidelines for business education, discussion of their scope and their application to teaching operations research. In: *RISTAL - Research in Subject Teaching and Learning*. 2019; 2, pp. 32-50
- Steinberger, Lukas; Leeb, Hannes: Prediction when fitting simple models to high-dimensional data. In: *Annals of Statistics*. 2019; 47, 3, pp. 1408-1442

van Ackooij, Wim; Escobar Luna-Barrera, Debora Daniela; Glanzer, Martin; Pflug, Georg: Distributionally robust optimization with multiple time scales: valuation of a thermal power plant. In: Computational Management Science. 2019

Contributions to Proceedings and Edited Books

Cooper, Matthew W.; Brown, Molly E.; Hochrainer-Stigler, Stefan, Pflug, Georg; McCallum, Ian; Fritz, S., Silva, Julie; Zvoleff, Alexander: Mapping the effects of drought on child stunting. In: Proceedings of the National Academy of Sciences of the United States of America (PNAS). 2019; 116, 35, pp. 17219-17224

Geiersbach, Caroline; Welker, Kathrin; Loayza, Estefania: Computational Aspects for Interface Identification Problems with Stochastic Modelling. In: ArXiv. 2019

Gutjahr, Walter; Montemanni, Roberto: Stochastic search in metaheuristics. In: Handbook of Metaheuristics. Editors: Gendreau, M. & Potvin, J-Y. 2019, Cham: Springer, pp. 513-540 (International Series in Operations Research & Management Science, 272).

Riedler, Martin; Ruthmair, Mario; Raidl, Günther R.: Strategies for Iteratively Refining Layered Graph Models. In: Proceedings of the 11th International Workshop on Hybrid Metaheuristics. Editors: Blesa, M. J., Blum, C., Gambini Santos, H., Pinacho-Davidson, P. & Godoy del Campo, J. Springer, 2019; pp. 46-62 (Lecture Notes in Computer Science)

Working Papers

Birghila, Corina; Engelke, Sebastian: Robust bounds for tail index. In preparation.

Birghila, Corina; Pflug, Georg; Hochrainer-Stigler, Stefan: Risk layering under ambiguity: an application to farmers exposed to drought risk. Under revision.

Cebiroglu, Gökhan; Hautsch, Nikolaus; Walsh, Christopher: Revisiting the Stealth Trading Hypothesis: Does Time-Varying Liquidity Explain the Size-Effect? 2019; Center for Financial Studies, 625

6 Dissemination of Research

Presentations at Workshops, Conferences and Outside Seminars

	Event/Institution	Title of Presentation
Nicolai Amann	Statistiktage 2019 der "Österreichische Statistische Gesellschaft" (ÖSG), Vienna, Austria (Invited Speaker)	Asymptotic Confidence-Regions Based On The Adaptive Lasso With Partial Consistent Tuning
Nicolai Amann	24 th Young Statisticians Meeting, Basovizza, Italy	Asymptotic Confidence-Regions Based On The Adaptive Lasso With Partial Consistent Tuning

Nicolai Amann	10 th International Workshop on Simulation and Statistics, Salzburg, Austria	Asymptotic Confidence-Regions Based On The Adaptive Lasso With Partial Consistent Tuning
Corina Birghila	Freiburg–Wien–Zürich Seminar, Vienna, Austria	Robust tail index: new insights
Corina Birghila	Freiburg–Padova–Wien–Zürich Seminar, University of Padova, Italy	Robust Pareto insurance contract
Corina Birghila	VCMF, Vienna, Austria	Pareto robust reinsurance contracts
Corina Birghila	IME TU Munich, Germany	Optimal risk layer insurance under Wasserstein-type ambiguity
Corina Birghila	EVA, University of Zagreb, Croatia	Distributionally robust bounds for tail indices
Corina Birghila	SIAM, University of Toronto, Canada	Risk Layering Insurance Contract under Model Uncertainty
Immanuel Bomze	One-day symposium on Integer Programming and Algorithms), Paris, France (Keynote Speaker)	Continuous quadratic approach to the robust maximum vertex-weight clique problem (MVWCP)
Immanuel Bomze	6 th World Congress on Global Optimization, Metz, France (Keynote Speaker)	Global optimality certificates and tighter dual bounds by copositivity
Immanuel Bomze	SOR 19 - The 15 th International Symposium on Operational Research in Slovenia, Bled, Slovenia (Invited Speaker)	Robust Clustering in Social Networks Michael Kahr (Contributor) Markus Leitner (Contributor)
Immanuel Bomze	Università degli Studi di Brescia, Brescia, Italy (Invited Speaker)	Robust clustering in social networks
Immanuel Bomze	École polytechnique fédérale de Lausanne, Lausanne, Switzerland (Invited Speaker)	Robust clustering in social networks
Immanuel Bomze	International Federation of Classification Societies Conference, Thessaloniki, Greece	Trust your data or not - Standard remains Standard (QP); implications for robust clustering in social networks Michael Kahr (Contributor) Markus Leitner (Contributor)
Immanuel Bomze	University of Augsburg, Germany (Invited Speaker)	Towards responsible game theory - from Kant to a copositive view on a parametric QP

Immanuel Bomze	17 th Workshop on Advances in Continuous Optimization, Glasgow, UK	Towards responsible game theory - from Kant to a copositive view on a parametric QP Werner Schachinger (Contributor) Jürgen Weibull (Contributor)
Immanuel Bomze	2 nd IMA and OR Society Conference on Mathematics of Operational Research, Birmingham, UK (Invited Speaker)	First-order methods for the impatient: support identification in finite time with convergent Frank-Wolfe variants Francesco Rinaldi (Contributor) Samuel Rota Bulò (Contributor)
Immanuel Bomze	Games, Dynamics and Optimization Workshop, Cluj-Napoca, Rumania (Invited Speaker)	First-order methods for the impatient: support identification in finite time with convergent Frank-Wolfe variants Francesco Rinaldi (Contributor) Samuel Rota Bulò (Contributor)
Immanuel Bomze	Workshop 2: Numerical Algorithms in Nonsmooth Optimization, Vienna, Austria (Keynote Speaker)	Non-convex min-max fractional quadratic problems under quadratic constraints: copositive relaxations Paula Alexandra Amaral (Contributor)
Immanuel Bomze	Università degli Studi di Pisa, Pisa, Italy (Invited Speaker)	The simplest of the hard problems...
Martin Glanzer	XV International Conference on Stochastic Programming, Norway	Multiscale stochastic optimization: modeling aspects and scenario generation
Martin Glanzer	Princeton University, New Jersey, USA	Multiple time scales and model ambiguity in multistage stochastic optimization
Nikolaus Hautsch	"Market Microstructure": The CFS-Imperial Workshop, London, UK (Invited Speaker)	Limits to Arbitrage in Markets with Stochastic Settlement Latency
Nikolaus Hautsch	European Central Bank (ECB), Frankfurt, Germany (Invited Speaker)	How effective are trading pauses?
Nikolaus Hautsch	4 th International Workshop in Financial Econometrics, Maceio, Brazil (Invited Speaker)	Trust Takes Time: Limits to Arbitrage in Decentralized Markets
Nikolaus Hautsch	Vienna Congress on Mathematical Finance 2019, Vienna, Austria (Invited Speaker)	Limits to Arbitrage in Markets with Stochastic Latency

Nikolaus Hautsch	Vienna Congress on Mathematical Finance 2019 Vienna, Austria (Invited Speaker)	Panel Discussion „The big data revolution in mathematical finance“
Nikolaus Hautsch	International Conference on Fintech and Financial Data Science, Dublin, Ireland (Keynote Speaker)	Limits to Arbitrage in Markets with Stochastic Latency
Nikolaus Hautsch	Workshop on Asset Pricing and Risk Management, Singapore (Invited Speaker)	Tutorial on “High-Frequency Econometrics”
Nikolaus Hautsch	Workshop on Asset Pricing and Risk Management, Singapore (Invited Speaker)	Limits to Arbitrage in Markets with Stochastic Latency
Nikolaus Hautsch	Justus-Liebig-Universität Gießen (JLU), Germany (Invited Speaker)	Local Mispricing and Microstructural Noise: A Parametric Perspective
Nikolaus Hautsch	Wirtschaftsforum der Führungskräfte, Austria (Keynote Speaker)	Hochfrequenztechnologie und Blockchain: Finanzmärkte im Umbruch
Nikolaus Hautsch	The University of Chicago, Chicago, Illinois, USA (Invited Speaker)	Limits to Arbitrage in (Blockchain-Based) Markets with Stochastic Latency
Michael Kahr	Operations Research 2019: Annual scientific conference of the national Operations Research Societies of Germany, Austria and Switzerland, Dresden, Germany	Influence maximization with competition in social networks and a Twitter case study Markus Leitner (Contributor) Mario Ruthmair (Contributor) Markus Sinnl (Contributor)
Michael Kahr	1 st Euro Young Workshop (EYW) Sevilla, Spain	Influence maximization with competition in social networks and a Twitter case study Markus Leitner (Contributor) Mario Ruthmair (Contributor) Markus Sinnl (Contributor)
Irene Klein	Freiburg -Padova-Wien-Zürich Workshop, Zurich, Switzerland (Invited Speaker)	Some thoughts about risk measures
Irene Klein	Freiburg-Padova-Wien-Zürich Workshop, Padua, Italy (Invited Speaker)	Utility maximization in a two filtration setting
Hannes Leeb	TU Graz, Graz, Austria (Invited Speaker)	Prediction when fitting simple linear models to high-dimensional data

Hannes Leeb	7 th Channel Network Conference, Harpenden, UK (Invited Speaker)	Statistical inference with F-statistics when fitting simple models to high-dimensional data
Hannes Leeb	10 th Workshop on New Developments in Econometrics and Time Series, Graz, Austria (Invited Speaker)	Statistical inference with F-statistics when fitting simple models to high-dimensional data
Georg Pflug	RICAM special semester, Linz, Austria (Invited Speaker)	Multistage robust convex optimization problems: a sampling based approach
Georg Pflug	Dependence Modeling, Agistri, Greece (Invited Speaker)	Modeling systemic risk and the Freund copula
Georg Pflug	Workshop on Stochastic Models, Statistics and their Application (SMSA), Dresden, Germany	Model ambiguity in decision making under uncertainty
Georg Pflug	Karlsruhe Uncertainty Workshop, St. Martin, Germany (Invited Speaker)	Model ambiguity in multistage decision making under uncertainty
Georg Pflug	71 st Workshop on Advances in Nonsmooth Analysis and Optimization: Erice, Italy (Invited Speaker)	Stochastic optimization in function spaces with applications
Georg Pflug	Technische Universität München, Munich, Germany (Invited Speaker)	Ambiguity and distributionally robustness in stochastic optimization
Georg Pflug	CMS-MMEI; Computational Management Science - Mathematical Methods in Industry and Economics, Chemnitz, Germany (Invited Speaker)	Stochastic constrained optimization in Hilbert spaces with applications
Georg Pflug	SMSA 2019 - Stochastic Models, Statistics and their Application in March 2019, Dresden, Germany (Invited Speaker)	Nonparametric Distributional Robustness in Multistage Stochastic Optimization
Mathias Pohl	Vienna-Zurich Symposium for young researchers in Financial Mathematics and related fields, Vienna, Austria	Ambiguity
Mathias Pohl	Vienna Congress on Mathematical Finance 2019, Vienna, Austria	Robust risk aggregation with neural networks
Mathias Pohl	The Sixth International Conference on Continuous Optimization, Berlin, Germany	Robust risk aggregation with neural networks

Mathias Pohl	SIAM Conference for Financial Mathematics and Engineering 2019, Toronto, Canada	Robust risk aggregation with neural networks
Mathias Pohl	University Konstanz, Germany (Invited Speaker)	The amazing power of dimensional analysis: Scaling laws in finance
Benedikt Pötscher	Department of Statistics, University of Bologna, Bologna, Italy (Invited Speaker)	On Autocorrelation Robust Tests and Testing for Trends
Benedikt Pötscher	4 th Vienna Workshop on High-Dimensional Time Series in Macroeconomics and Finance, Vienna, Austria (Invited Speaker)	On Autocorrelation Robust Tests and Testing for Trends
Benedikt Pötscher	Workshop "New Developments in Econometrics and Time Series", TU Graz, Austria (Invited Speaker)	On Autocorrelation Robust Tests and Testing for Trends
Benedikt Pötscher	Department of Economics, University of Maryland, College Park, USA (Invited Speaker)	On Autocorrelation Robust Tests and Testing for Trends
Mario Ruthmair	University of Strathclyde, Glasgow, UK (Invited Speaker)	Arc Routing with Electric Vehicles
Mario Ruthmair	EURO 2019: European Conference on Operational Research, Dublin, Ireland	Large-scale Influence Maximization via Maximal Covering Location
Mario Ruthmair	Workshop of the EURO Working Group on Vehicle Routing and Logistics optimization (VeRoLog), Sevilla, Spain	Electric Arc Routing
Teresa Scarinci	INDAM intensive trimester Shape optimization, control and inverse problems for PDEs, Naples, Italy	Primal-dual splitting methods for control of PDEs
Teresa Scarinci	Workshop on Control Theory and Applications, L'Aquila, Italy	Primal-dual forward-backward methods for PDE-constrained optimization problems
Lukas Steinberger	12 th International Conference of the ERCIM WG on Computational and Methodological Statistics (Invited Speaker)	Estimating functionals under local differential privacy

Departmental Seminar (ISOR Colloquium)

January 7	Wim van Ackooij (EDF Paris, France)	Generalized differentiation of robust constraints (joint work with René Henrion and Pedro Perez-Aros)
January 14	Arne Bathke (Univ. Salzburg, Austria)	To rank or to bootstrap? Non- and semiparametric approaches to inference for multivariate data
January 21	Danijel Kivaranovic, Manveer Mangat (all ISOR)	Public presentation of PhD projects (FOeP)
January 28	Constantin Zălinescu (Univ. Iași, Romania)	On canonical duality theory. What is and how much efficient is it?
March 11	George Tauchen (Duke University, USA)	Jump Factor Models in Large Cross-Sections
March 18	Ralf Werner (Universität Augsburg, Germany)	Efficient Computation of the Prokhorov Metric for Finitely Supported Distributions (joint work with C. Drescher and J. Schwinn)
April 1	Fabio Tardella (Univ. Rome "La Sapienza", Italy)	Discrete midpoint convexity: a unifying framework for convexity on the integer lattice (joint work with S. Moriguchi, K. Murota and A. Tamura)
April 29	Roberto Guglielmi (Gran Sasso Science Inst., Italy)	Turnpike properties and strict dissipativity for linear optimal control problems
May 6	Sergio García Quiles (Univ. Edinburgh, UK)	A tentative definition of statistical inference across scales
May 13	Roberto Roberto (VU Amsterdam, the Netherlands)	An Exact Solution Framework for Multi-Trip Vehicle Routing Problems with Time Windows
May 20	Claudia Archetti (Univ. Brescia, Italy)	A Kernel Search Heuristic for the Multi-Vehicle Inventory Routing Problem (joint work with G. Guastaroba, D. L. Huerta-Muñoz, M. Grazia Speranza)
May 27	Alec Morton (Stathclyde University, UK)	Two Resource Allocation Problems in Global Health
June 17	Vanesa Guerrero Lozano (Univ. Carlos 3 Madrid, Spain)	On mixed integer nonlinear optimization to interpret and visualize complex datasets
October 7	Patrick Groetzner (Univ. Augsburg, Germany)	Multiobjective Optimization Under Uncertainty: A (Relative) Robust Regret Approach

October 14	Hans Manner (Univ. Graz, Austria)	Model and Moment Selection in Factor Copula Models
October 21	Rasmus Tangsgaard Varneskov (Copenhagen Business School, Denmark)	Consistent Inference for Predictive Regressions in Persistent Economic Systems (joint work with Torben G. Andersen, Northwestern University)
October 28	Eric Gautier (Toulouse School of Economics, France)	Square-root nuclear norm penalized estimator for panel data models with approximately low-rank unobserved heterogeneity
November 4	Philip Thompson (Univ. Cambridge, UK)	Variance-Based Extragradient Methods with Line Search for Stochastic Variational Inequalities
November 11	Karl Oskar Ekvall (TU Vienna, Austria)	Consistent Maximum Likelihood Estimation in Mixed Models Using Subsets
November 18	Adriano Festa (Politecnico Torino Italy)	A semi-Lagrangian scheme for Hamilton-Jacobi equations on networks and its application to vehicle traffic models
November 25	Paula Carroll (UC Dublin, Ireland)	Designing Low Voltage Electricity Distribution Networks to facilitate Low Carbon Technologies
December 2	Guiseppe Cavaliere (Univ. Bologna, Italy)	Random Bootstrap Measures
December 9	Christian Brownlees (Universitat Pompeu Fabra, Spain)	Projected Dynamic Conditional Correlations

7 Grants and Externally Funded Research Projects

Immanuel Bomze (Project-Coordinator, taken over from Ivana Ljubic in 09/2015) Research Associate: Markus Sinnl	Title: Network Optimization in Bioinformatics and Systems Biology Funding: FWF Funding period: 2014-2019
Christa Cuchiero (Project-Coordinator), Irene Klein (Co-Investigator), Thorsten Schmidt (Co-Investigator) Research Associate: Lars Niemann	Title: Dynamic Uncertainty Modeling in Finance Funding: FWF Funding period: 2018-2021
Nikolaus Hautsch (Principal Investigator) Research Associate: Ilya Archakov	Title: Order Book Foundations of Price Risks and Liquidity: An Integrated Equity and Derivatives Markets Perspective Funding: FWF Funding period: 2017-2021

Nikolaus Hautsch (Principal Investigator)	Title: Vienna Graduate School of Finance Funding: doc.funds, FWF Funding period: 2018-2020
Markus Leitner (Principal Investigator) Research Associates: Mario Ruthmair, Michael Kahr	Title: Optimization and Analysis of Large-Scale Networks Funding: WWTF Funding period: 2015-2019
Georg Pflug (Project-Coordinator) Immanuel Bomze (Co-Investigator), Radu Ioan Bot (Co-Investigator), Monika Henzinger (Co-Investigator), Arnold Neumaier (Co-Investigator), Günther Raidl (Co-Investigator) Hermann Schichl (Co-Investigator) Research Associates: Axel Böhm, Marko Djukanovic, Markus Gabl, Caroline Geiersbach, Mathias Horn, Morteza Kimiaei, Stefan Neumann, Dang Khoa Nguyen	Title: Vienna Graduate School on Computational Optimization (VGSCO) Funding: FWF Funding period: 2016-2020
Georg Pflug (Project-Coordinator) Research Associates: Daniela Escobar, Martin Glanzer	Title: Incorporating Error in the Management of Electricity Portfolios Funding: Université de Paris Sud Mathématique – FMJH Funding period: 2017-2019
Erhard Reschenhofer (Principal Investigator) Research Associate: Thomas Stark	Title: Stock return and volatility forecasting with order book data Funding: OeNB Funding period: 2019-2021
Walter Schachermayer (Project- Coordinator), Georg Pflug (Co- Investigator), Nikolaus Hautsch (Co- Investigator) Research Associates: Mathias Pohl, Alexander Ristig, Ludovic Tangpi	Title: Portfolio Risk and Asset Allocation - Utilizing High- Frequency Information in High Dimensions Funding: WWTF Funding period: 2015-2019

8 Research Stays at Other Institutions

	Institution	Weeks
Immanuel Bomze	Universidade do Porto, Portugal	1
Immanuel Bomze	Université Paris XIII, France	1
Martin Glanzer	Princeton University, USA	1
Martin Glanzer	University of Chicago, USA	11

Michael Kahr	Vrije Universiteit Amsterdam, The Netherlands	9
Georg Pflug	Università degli Studi di Bergamo, Italy	2
Georg Pflug	Freie Universität Bozen, Italy	1
Mario Ruthmair	Vrije Universiteit Amsterdam, The Netherlands	0,5
Mario Ruthmair	Universidade de Lisboa, Portugal	1

9 Other Faculty Activities

Editorial Work

Immanuel Bomze	<p>Member of Editorial Board</p> <ul style="list-style-type: none"> ▪ Central European Journal of Operations Research ▪ EURO Journal on Computational Optimization ▪ European Journal of Operational Research ▪ Journal of Global Optimization ▪ Optimization Letters ▪ Operations Research Perspectives
Walter J. Gutjahr	<p>Co-Editor</p> <ul style="list-style-type: none"> ▪ OR Spectrum <p>Associate Editor</p> <ul style="list-style-type: none"> ▪ Central European Journal of Operations Research <p>Member of Editorial Review Board</p> <ul style="list-style-type: none"> ▪ Production and Operations Management <p>Member of Editorial Board</p> <ul style="list-style-type: none"> ▪ EURO Journal on Decision Processes
Walter J. Gutjahr & Alois Pichler	<p>Guest Editor</p> <ul style="list-style-type: none"> ▪ Special Issue "Uncertainty, economics and optimization: recent developments". Computational Management Science 16 (2019)
Nikolaus Hautsch	<p>Managing Editor</p> <ul style="list-style-type: none"> ▪ Quantitative Finance <p>Associate Editor</p> <ul style="list-style-type: none"> ▪ Journal of Applied Econometrics ▪ Journal of Business and Economic Statistics ▪ International Journal of Forecasting ▪ Market Microstructure and Liquidity ▪ Journal of Financial Econometrics <p>Editorial Board</p> <ul style="list-style-type: none"> ▪ Econometrics

- Georg Pflug Associate Editor
- Austrian Journal of Statistics
 - Central European Journal of Operations Research
 - Computational Optimization and Applications
 - Computational Management Science
 - Energy Systems: Optimization, Modeling, Simulation and Economic Aspects
 - Financial Mathematics and Applications
 - Journal of Stochastic Analysis
 - Mathematical Methods of OR
 - Operations Research
 - Statistics and Risk Modeling
 - Stochastic Programming Electronic Publication Series
- Benedikt M. Pötscher Co-Editor
- Econometric Theory
- Associate Editor
- Journal of Statistical Planning and Inference

Refereeing

- Immanuel Bomze
- Journal of Optimization Theory and Applications
 - Journal of Global Optimization
 - Mathematical Programming Series A
- Walter J. Gutjahr
- Annals of Operations Research (1)
 - Central European Journal of Operations Research (2)
 - Computational Management Science (1)
 - Computers and Industrial Engineering (1)
 - European Journal of Operational Research (4)
 - International Journal of Disaster Risk Reduction (1)
 - International Journal of Production Economics (1)
 - Operations Research for Health Care (1)
 - OR Spectrum (3)
 - Socio-Economic Planning Sciences (1)
- Nikolaus Hautsch
- Annals of Statistics
 - Journal of the American Statistical Association
 - Journal of Applied Econometrics (2)
 - Journal of Econometrics (2)
 - Quantitative Finance (2)
- Markus Leitner
- Computers and Operations Research
 - European Journal of Operational Research
 - INFORMS Journal on Computing
 - Journal of Global Optimization
 - Networks
 - Transportation Science
- Benedikt M. Pötscher
- Econometric Theory

Werner Schachinger ▪ Mathematical Programming

Public Relations Activities

- Nikolaus Hautsch ▪ Panel Discussion „The big data revolution in mathematical finance“ at Vienna Congress on Mathematical Finance, 09.09. 2019, Vienna
- Keynote Speech at Supervisory Board of Austria Manager Association (Wirtschaftsforum der Führungskräfte), Vienna, 14 May 2019: „Hochfrequenztechnologie und Blockchain: Finanzmärkte im Umbruch“

Other Professional Activities

- Immanuel Bomze ▪ Deputy Director of Studies Programme Statistics, Univ. Vienna, Austria
- Organizer of the Vienna Graduate School on Computational Optimization, Univ. Vienna, Austria
- Board Member of Research Platform “Data Science@Uni Vienna”
- EURO EC Meeting, Antwerp, Belgium, Jan/Feb 2019
- EURO President, Univ. Brescia, Italy, Apr/May 2019
- EJOR Editorial Meeting, Univ. Bocconi, Milan, Italy, May 2019
- EURO President, Univ. Bocconi, Milan, Italy, May 2019
- EURO President, Aalto Univ., Helsinki, Finland, May 2019
- EURO President, 30th European Conference on Operational Research, Univ. Dublin, Irland, Jun 2019
- EURO President, EUROPT 2019, Univ. Strathclyde, Glasgow, UK, Jun 2019
- EURO President, 15th International Symposium on Operations Research (SOR’19), Bled, Slovenia, Sep 2019
- Referee Defense of Enrico Bettiol, Univ. Paris XIII, France, Nov 2019
- Management Committee Meeting COST Project GAMENET Conference 2019, Prague, Czech Republic, Nov 2019
- Walter J. Gutjahr ▪ Program Committee Member EvoCOP 2019
- Nikolaus Hautsch ▪ Dean of Faculty of Business, Economics and Statistics, Univ. Vienna, Austria
- Board Member of Research Platform “Data Science@Uni Vienna”
- Irene Klein ▪ Co-Organizer of 12th Freiburg-Wien-Zürich Seminar, Vienna, Austria, Jan 2019
- Co-Organizer of Freiburg-Wien-Padova-Zürich Seminar, Padova, Italy, May 2019
- Co-Organizer of Freiburg-Wien-Padova-Zürich Seminar, Padova, Italy, Oct 2019
- Co-Organizer of Vienna Congress on Mathematical Finance, Vienna, Austria, Sep 2019

- Hannes Leeb
- Deputy Director of Studies PhD Programme, Univ. Vienna, Austria (10/2019-09/2020)
 - Board Member of Research Platform “Data Science@Uni Vienna”
- Mathias Pohl
- Organizing Committee Member 13th European Summer School in Financial Mathematics
- Georg Pflug
- Speaker of the Vienna Graduate School on Computational Optimization, Univ. Vienna, Austria
 - Council Member for Applied Mathematics at the Austrian Science Fund (FWF)
- Benedikt M. Pötscher
- Head of Department
- Erhard Reschenhofer
- Deputy Head of Department