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

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ANNUAL REPORT 2016

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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 2016. 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. During the academic year 2015/16 the department taught also many undergraduate and graduate courses for programs run by other departments, including the Department of Business Administration and the Department of Economics.

In 2016, our department has been strengthened by the arrival of Markus Gabl, Caroline Geiersbach, Johannes Happenhofer, Kory Johnson, Michael Kahr, Andreas Wittmann and Christian Zwatz as assistants.

Ivana Milovic and Reinhard Ullrich successfully defended their theses and graduated from the PhD Programme in Statistics and Operations Research.

Markus Leitner received his habilitation (venia docendi) in Operations Research and is now Assistant Professor.

There were also several departures. Yousef Ello (Sys Admin) left the department. The following people left the department to pursue their next career steps at excellent universities : David Preinerstorfer started as Postdoc at CREATES, Aarhus University and continued then as Postdoc at ECARES, Université libre de Bruxelles. Lukas Steinberger started as Postdoc at Freiburg University. The department regrets their departures but congratulates them to their successful new career steps. We wish them well in their new positions.

I would like to express special thanks to Dominique Sundt for editing the Annual Report 2016.

Irene Klein

(Head of Department)

Vienna, November 2017

2 Faculty and Staff

Regular Faculty

Corina Birghila (MSc)	Extreme Value Theory, Insurance Pricing
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
Gökhan Cebiroglu (Dr.)	Financial Econometrics, Market Microstructure, Structural Modelling, Mechanism and Market Design, Financial Markets, Quantitative Finance, Game Theory, Asset Pricing, Efficient Programming, Optimization, Genetic Algorithms, High-Frequency Trading
Marek Chudy (Mgr.)	Macroeconomic Forecasting, Financial Econometrics, Model Selection Methods
Daniela Escobar (MSc)	Linear and Non-Linear Time Series Analysis, Risk Management, Application in Energy Markets
Martin Glanzer (Dipl.-Ing.)	Stochastic optimization and Quantitative Finance
Walter Gutjahr (Prof.)	Optimization Theory, Discrete Optimization, Stochastic Modeling, Multicriteria Decision Analysis
Sandor Guzmics (MSc)	Stochastic Optimization, Financial Mathematics, Systemic Risk in Financial Systems
Johannes Happenhofer (MSc)	
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. nference when fitting mis-specified models. Admissibility of confidence sets.Pitfalls in inference after model selection when using traditional approaches.

Ivana Ljubic (Ass. Prof., on leave)	Algorithmic Operations Research, Algorithm Engineering
Georg Pflug (Prof.)	Mathematical Statistics, Stochastic Optimization, Risk Management
Benedikt Pötscher (Prof.)	Econometrics, Statistics, Time Series Analysis
David Preinerstorfer (Dr.)	Mathematical Statistics, Econometrics, Time Series Analysis, Psychometrics
Erhard Reschenhofer (Assoc. Prof.)	Time Series Analysis, Financial Econometrics, Automatic Model Selection, Chronobiology
Werner Schachinger (Assoc. Prof.)	Optimization, Probabilistic Analysis of Algorithms
Reinhard Ullrich (MMag.)	Evolutionary Game Theory and Dynamical Systems
Christopher Walsh (Dr.)	Non- and Semiparametric Statistics and Econometrics, Financial Econometrics, Time Series, High Dimensional Statistics
Christian Zwatz (Mag.)	

Externally Funded Faculty

Georg Brandstätter (Dipl.-Ing.)	Combinatorial Optimization, Integer Linear Programming, Transportation and Logistics Optimization
Markus Gabl (MSc)	Copositve Optimization, Quadratic Optimization, Conic Optimization, Robust Optimization
Caroline Geiersbach (Dipl.-Ing.)	Optimal control of PDEs, Stochastic Optimization, Shape Optimization, Multiscale Methods, Numerical Methods
Michael Kahr (MSc)	(Mixed) integer linear programming, stochastic and robust optimization, conic optimization, large-scale networks
Markus Leitner (Dr.)	Operations Research, Combinatorial Optimization, (Mixed) Integer Linear Programming, Multi-objective Optimization
Martin Luipersbeck (Dipl.-Ing.)	(Mixed) Integer Programming, Network Design, Algorithm
Ivana Milovic (MAS)	Model Selection in High-Dimensional Linear Models
Mathias Pohl (MSc)	Dependence modeling and Copulas, High Frequency Trading, Model Ambiguity, Optimal Transport, Portfolio Optimization, Robust Optimization

Alexander Ristig (Dr.)	Financial econometrics and statistics, Copula and quantile-based dependence concepts, Iterative estimation techniques, Applications in finance, risk management and economics
Mario Ruthmair (Dr.)	
Nina Senitschnigg (Dr., on leave)	Mathematical Statistics, Predictive Inference, Shrinkage
Markus Sinnl (PhD)	Theoretical and Computational Aspects of Mixed Integer (Non-)Linear Programming, Decomposition Methods for Mixed Integer (Non-)Linear Programming, Bilevel Programming, Combinatorial Optimization, Bi-and Multi-Objective Optimization, Robust and Stochastic Optimization Matheuristics, Areas of Application: Network Design, Telecommunications, Systems Biology
Lukas Steinberger (Dr.)	Mathematical Statistics, Statistical Analysis of High-Dimensional Data
Andreas Wittmann (BSc)	Risk Management

External Lecturers (Academic Year 2015/16)

Andreas Baierl, Manfred Deistler (TU Vienna), Evelina Erlacher, Karl Ewald, Florian Frommlet (MedUni Vienna), Miguel Gallach, Andrea Gaunersdorfer, Thomas Glaser, Yuri Goegebeur (Syddansk Universitet, Denmark), Wilfried Grossmann, Marcus Hudec, Milos Kopa (Charles University Prague), Nysret Musliu (TU Vienna), Herbert Nagel (WU Vienna), Andreas Novak, Daniel Obszelka, Gerhard Paulinger, Peter Reiter, Robin Ristl,Harald Schwab, Alexander Tichy (VetMedUni Vienna), Gabriele Uchida,Johannes Wessely.

Teaching Assistants (Academic Year 2015/16)

Alena Bachleitner, Annemarie Grass, Bernhard Kober, Michael Kossmeier, Daniel Povolny, Alexander Ruth, Karina Traub, Lu Bo Zhang

Administrative Assistants

Birgit Ewald, Julia Brandstätter, Gerald Kamhuber (on leave), Vera Lehmwald, Manuela Nicham-Zorn, Dominique Sundt

System Administrators

Jürgen Berlakovich, Stefan Geissler, Rolf Karner, Andreas Loibl, Svetlana Mihajlovic

3 Visitors

Kurt Anstreicher (Iowa State University), Amir Beck (TECHNION Israel), István Berkes (TU Graz, Austria), Paula Brito (University of Porto, Portugal), Matteo Fischetti (University of Padova, Italy), Bernard Fortz (Universite Libre de Bruxelles, Belgium), Jacek Gondzio (University of Edinburgh), Luís Gouveia (Universidade de Lisboa, Portugal), Anthony D. Hall (University of Technology Sydney, Australia), Michele Monaci (Università di Bologna, Italy), Francesca Maggioni (Università di Bergamo, Italy), Filippo Masini (Università di Bologna, Italy)

4 Teaching

Theses Supervised

PhD Theses in Progress

Supervisor	Author	Title
Immanuel Bomze	Markus Gabl	A copositive approach to adjustable robust optimization with uncertain recourse
Immanuel Bomze	Philipp Hungerländer (Alpen-Adria-Universität Klagenfurt, Austria)	Extensions of the Traveling Salesman Problem
Immanuel Bomze, Markus Leitner*	Michael Kahr	Optimization in Social Networks: Influence Propagation and Community Detection
Nikolaus Hautsch	Akos Horvath	The Effectiveness of Post-Crisis Regulatory Measures
Hannes Leeb	Johannes Happenhofer	TBA
Ivana Ljubic, Markus Leitner*	Georg Brandstätter	Solving optimization problems arising in the context of electric car sharing systems
Ivana Ljubic, Markus Leitner*	Martin Luipersbeck	Large-scale Network Optimization: Applications in Bioinformatics
Georg Pflug, Walter Schachermayer	Mathias Pohl	Robust portfolio optimization with copulas

Georg Pflug	Corina Birghila	Insurance premium under ambiguity
Georg Pflug	Daniela Escobar	Analysis of Risk Premia in Energy Markets
Georg Pflug	Caroline Geiersbach	Stochastic Models in Shape Optimization
Georg Pflug	Martin Glanzer	Pricing of Contingent Claims under Model Ambiguity
Georg Pflug	Sandor Guzmics	Systemic Risk in Financial Systems
Georg Pflug	Eric Laas-Nesbitt	Trust-Region Methods for Endogenous Stochastic Optimization
Benedikt M. Pötscher	Christian Zwatz	TBA
Erhard Reschenhofer	Marek Chudy	Analysis and Predication of Economic Time Series
Erhard Reschenhofer	Hannes Leu	Die Aktivierung von Verlustvorträgen als Instrument zur Ergebnissteuerung von Industrieunternehmen – Eine theoretische und empirische Analyse

PhD Theses Finished

Supervisor	Author	Title
Immanuel Bomze, Werner Schachinger*	Reinhard Ullrich	Selecting equilibria from an ample choice
Hannes Leeb	Ivana Milovic	Conditional means of low-dimensional projections from high-dimensional data

Master Theses in Progress

Supervisor	Author	Title
Immanuel Bomze	Katharina Eibensteiner	Machine Learning and Optimization
Nikolaus Hautsch	André Thea	Forecasting Realised VolatilityUsing Jumps at Ultra-High Frequency
Irene Klein	Tommaso Spano	TBA
Georg Pflug	Theodoros Kouimtsidis	Systemic risk for the Austrian banking system
Werner Schachinger	Simon Klima	Random Graphs and the Giant Component

Master Theses Finished

Supervisor	Author	Title
Immanuel Bomze	Markus Gabl	Semidefinite programming: theory and applications in finance
Walter J. Gutjahr	Wolfgang Haidinger	Kognitive Schwierigkeit von Präferenz- versus Indifferenzaussagen: Ein Experiment zum Materialeinkaufsverhalten österreichischer Dachdecker
Walter J. Gutjahr	Robin Ristl	Optimal exact tests for multiple binary endpoints
Walter J. Gutjahr, Markus Leitner*	Michael Kahr	Determining optimal locations for electric-car sharing stations under stochastic demand
Nikolaus Hautsch	Florian Johannes	Optimal Order Placement in Limit Order Book Markets
Nikolaus Hautsch	Stefan Müller	Volatility Knockout Options – A Pricing Guide
Nikolaus Hautsch	Ana Petrovic	Value-at-Risk Estimation Using Time-Varying Copulas
Irene Klein	Marko Kuncic	Pricing of barrier options
Georg Pflug	Christian Zwatz	Copula-GARCH-Modelle angewendet auf CDS-Spreads einer Auswahl internationaler Banken
Erhard Reschenhofer	Thomas Sinkovics	Evaluation of the performance of the Automatic-1-2-3 trend indicator

Bachelor Theses

Immanuel Bomze (9), Hannes Leeb (2), Erhard Reschenhofer (3)

5 Publications

Journal Articles

Bomze, I.; Dickinson, P. J. C.; Still, G.: The structure of completely positive matrices according to their CP-rank and CP-plus-rank. *Linear Algebra and Its Applications*, 482, 191-206, 2016.

Bomze, I. M.: Copositivity for second-order optimality conditions in general smooth optimization problems. *Optimization: a journal of mathematical programming and operations research, 65(4)*, 2016.

Rath, S.; Gendreau, M.; **Gutjahr, W. J.**: Bi-objective stochastic programming models for determining depot locations in disaster relief operations. *International Transactions in Operational Research 23*, 2016.

Gutjahr, W. J.; Nolz, P. C.: Multicriteria optimization in humanitarian aid. *European Journal of Operational Research 252*, pp. 351-366, 2016.

Gutjahr, W. J.; Dzubur, N: Bi-objective bilevel optimization of distribution center locations considering user equilibria. *Transportation Research Part E 85*, pp. 1-22, 2016.

Gutjahr, W. J.; Pichler, A: Stochastic multi-objective optimization: a survey on non-scalarizing methods. *Annals of Operations Research 236*, pp. 475-499, 2016.

Bodnar, T.; **Hautsch, N**.: Dynamic conditional correlation multiplicative error processes. *Journal of Empirical Finance, 36*, 41-67, 2016.

Betz, F.; **Hautsch, N.**; Peltonen, T.; Schienle, M.: Systemic risk spillovers in the European banking and sovereign network. *Journal of Financial Stability, 25*, 206-224, 2016.

Cordero, F., **Klein, I.,** Perez-Ostafe, L.: Asymptotic proportion of arbitrage points in fractional binary markets. *Stochastic Processes and their Applications, 126(2)*, 315-336, 2016.

Cuchiero, C., **Klein, I.,** Teichmann, J.: A new perspective on the fundamental theorem of asset pricing for large financial markets. *Theory of Probability and Its Applications, 60(4)*, 561-579, 2016.

Leeb, H.; Steinberger, L.: On conditional moments of high-dimensional random vectors given lower-dimensional projections. *Bernoulli, forthcoming*.

Leeb, H.; Kabaila P.: Admissibility of the usual confidence set for the mean of a univariate or bivariate normal population: The unknown variance case. *J. R. Stat. Soc. Ser. B Stat. Methodol.*, doi:10.1111/rssb.12186.

Leitner, M.: Integer programming models and branch-and-cut approaches to generalized {0,1,2}-survivable network design problems. *Computational Optimization and Applications: an international journal, 65(1)*, 73-92, 2016.

Leitner, M.: Layered Graph Models and Exact Algorithms for the Generalized Hop-Constrained Minimum Spanning Tree Problem. *Computers & Operations Research, 65,* 1-18, 2016.

Stana, M., Sepiol, B., Kozubski, R., **Leitner, M.**: Chemical ordering beyond the superstructure in long-range ordered systems. *New Journal of Physics, 18, [113051],* 2016.

Fischetti, M., **Leitner, M.,** Ljubic, I., **Luipersbeck, M.,** Monaci, M., Resch, M., **Sinnl, M**.: Thinning out Steiner trees: a node-based model for uniform edge costs. *Mathematical Programming Computation*. 2016.

Leitner, M., Ljubic, I., **Sinnl, M.,** Werner, A.: ILP heuristics and a new exact method for bi-objective 0/1 ILPs: Application to FTTx-network design. *Computers & Operations Research, 72*, 128-146, 2016.

Álvarez-Miranda, E., Farhan, H., **Luipersbeck, M., Sinnl, M.:** A bi-objective network design approach for discovering functional modules linking Golgi apparatus fragmentation and neuronal death. *Annals of Operations Research, 1-26*, 2016.

Pflug, G., Pichler, A.: Time Consistent Decisions and Temporal Decomposition of Coherent Risk Functionals. *Mathematics of Operations Research, 41(2),* 682-699, 2016.

Boreiko, D., Kaniovski, Y., **Pflug, G.:** Numerical Modeling of Dependent Credit Rating Transitions with Asynchronously Moving Industries. *Computational Economics, 47(159),* 2016.

Heidergott, B., Haralambie, L., Löpker, A., **Pflug, G.:** Perturbation Analysis of finite Markov Chains. *Advances of Applied Probability, 48(1),* 255-273, 2016.

Pflug, G., Gross, P.: Behaviorial Pricing of Energy Swing Options by Stochastic Bilvel Optimization. *Energy Systems*, 2016.

Maggioni, F., **Pflug, G.:** Bounds and approximations for multistage stochastic programs. *SIAM Journal on Optimization, 26(1)*, 831–855, 2016.

Pflug, G., Thoma, P.: Efficient calculation of the Greeks for exponential Levy processes: An application of Measure Valued Differentiation. *Quantitative Finance, 16(2),* 247-257, 2016.

Pflug, G., Pichler, A.: From empirical observations to models for Stochastic Optimization: Convergence properties. *SIAM Journal on Optimization, 26(3)*, 1715-1740, 2016.

Hochrainer, S., Mochizuki, J., **Pflug, G**.: Impacts of Global and Climate Change Uncertainties for Disaster Risk Projections: A Case Study on Rainfall-Induced Flood Risk in Bangladesh. *Journal of Extreme Events, 3(1)*, 2016.

Pflug, G., Boreiko, D., Kaniovskyi, Y.: Modeling Dependent Credit Rating Transitions: A Comparison of Coupling Schemes and Empirical Evidence. *Central European Journal of Operations Research, 24(4)*, 989-1007, 2016.

Pflug, G., Pichler, A.: Time-inconsistent multistage stochastic programs: martingale bounds. *European Journal of Operational Research, 249(1),* 155-163, 2016.

Pötscher, B. M.; Preinerstorfer, D.: On Size and Power of Heteroscedasticity and Autocorrelation Robust Tests*, Econometric Theory 32*, 261-358. 2016

Pötscher, B. M.; Preinerstorfer, D.: On the Power of Invariant Tests for Hypotheses on a Covariance Matrix, *Econometric Theory 33*, 1-68. 2017

Asamer, J., Graser, A., Heilmann, B., **Ruthmair, M.**: Sensitivity Analysis for Energy Demand Estimation of Electric Vehicles. *Transportation Research Part D: Transport and Environment, 46*, 182-199, 2016.

Asamer, J., Reinthaler, M., **Ruthmair, M.**, Straub, M., Puchinger, J.: Optimizing Charging Station Locations for Urban Taxi Providers. *Transportation Research Part A: Policy and Practice, 85,* 233-246, 2016.

Sinnl, M., Ljubic, I., **Leitner, M.,** Salazar-González, J-J.: The Connected Facility Location Polytope. *Discrete Applied Mathematics*. 2016.

Fischetti, M., Ljubic, I., **Sinnl, M.**: Redesigning Benders Decomposition for Large-Scale Facility Location. *Management Science.*

Sinnl, M., Ljubic, I.: A Node-Based Layered Graph Approach for the Steiner Tree Problem with Revenues, Budget and Hop-Constraints. *Mathematical Programming Computation*. 2016.

Fischetti, M., Ljubic, I., **Sinnl, M.**: Benders decomposition without separability: a computational study for capacitated facility location problems. *European Journal of Operational Research*, *253*(3), 557-569,. 2016.

Steinberger, L.: The relative effects of dimensionality and multiplicity of hypotheses on the F-test in linear regression. *Electronic Journal of Statistics, 10(2),* 2584-2640, 2016.

Contributions to Proceedings and Edited Books

Brandstätter, G., Gambella, C., **Leitner, M.,** Malaguti, E., Masini, F., Puchinger, J., Vigo, D.: Overview of Optimization Problems in Electric Car-Sharing System Design and Management. In: H. Dawid, K. F. Doerner, G. Feichtinger, P. M. Kort, & A. Seidl (Hrsg.): *Dynamic Perspectives on Managerial Decision Making (Band 22, S. 441-471)*. (Dynamic Modeling and Econometrics in Economics and Finance; Band 22). Berlin: Springer, 2016.

Felberbauer, T.; Doerner, K. F.; **Gutjahr, W. J.:** Hybrid metaheuristics for project scheduling and staffing considering interruptions between project periods and labor contracts. In: Dawid, H., Doerner, K.F., Feichtinger, G., Kort, P., Seidl, A. (Eds.): *Dynamic Perspectives on Managerial Decision Making*, pp. 349-377, 2016.

Maniezzo, V.; Boschetti, M.; **Gutjahr, W. J.:** Stochastic real world warehouse premarshalling, *Proceedings Matheuristics 2016*, pp. 100-103, 2016.

Horvath, A., **Hautsch, N.**: NASDAQ Trading Pauses: Pacifiers or Amplifiers? *Proceedings Financial Econometrics and Empirical Asset Pricing Conference 2016*

Horvath, A.; **Hautsch, N**.: NASDAQ Trading Pauses: Pacifiers or Amplifiers? In: *1st Dauphine Microstructure Workshop*, 2016.

Klein, I., Schmidt, T.; Teichmann, J.: No arbitrage theory for bond markets. In: *Advanced Modelling in Mathematical Finance. In Honour of Ernst Eberlein.* Kallsen, J. & Papapantoleon, A. (Eds.). Springer, S. 381-421(Springer Proceedings in Mathematics & Statistics; Band 189). 2016.

Álvarez-Miranda, E., **Luipersbeck, M., Sinnl, M.:** Optimal Upgrading Schemes for Effective Shortest Paths in Networks. In: *Integration of AI and OR Techniques in Constraint Programming: 13th International Conference, CPAIOR 2016, Banff, AB, Canada, May 29 - June 1, 2016, Proceedings* (Band 9676, S. 406-420) (Lecture Notes in Computer Science), 2016.

Pötscher, B. M.; Leeb, H.: Testing in the Presence of Nuisance Parameters: Some Comments on Tests Post-Model-Selection and Random Critical Values, In: S. Ejaz Ahmed (Ed.): *Big and Complex Data Analysis: Methodology and Applications*, Springer, 2016.

Gouveia, L., **Ruthmair, M.,** Santos, D.: Um modelo de fluxo para o electric traveling salesman problem. In: C. Antunes, D. Cardoso; F. da Silva (Eds.): *A Investigação Operacional em Portugal - novos desafios novas ideias: homenagem ao Professor Luís Valadares Tavares* (p. 133-143). Lissabon: IST Press, 2016

Fischetti, M., Ljubic, I., Monaci, M., **Sinnl, M**.: Intersection Cuts for Bilevel Optimization. In: *Integer Programming and Combinatorial Optimization: 18th International Conference, IPCO 2016, Liège, Belgium, June 1-3, 2016, Proceedings* (Vol. 9682, p. 77-88). (Lecture Notes in Computer Science)

Walsh, C., Schmölz, A.: Stop the Mob! Pre-service Teachers Designing a Serious Game to Challenge Bullying. In: A. De Gloria (Ed.): *Games and Learning Alliance: 4th International Conference, GALA 2015, Rome, Italy, December 9-11, 2015; revised selected papers* (p. 431-440) (Lecture Notes in Computer Science, Vol. 9599)

Working Papers

Brandstätter, G.; Kahr, M.; Leitner, M.: Determining optimal locations for charging stations of electric car-sharing under stochastic demand. *(submitted)*

Chudy, M.; Reschenhofer, E.: Macroeconomic forecasting with many predictors *(submitted)*

Cebiroglu, G., Hautsch, N., Walsh, C.: Revisiting the Stealth Trading Hypothesis: Does Time-Varying Liquidity Explain the Size Effect?

Branke, J.; Corrente, S.; Greco, S.; **Gutjahr, W. J.:** Efficient Pairwise Preference Elicitation.

Felberbauer, T.; **Gutjahr, W. J.**; Doerner, K. F.: Stochastic project management: Multiple projects with multi-skilled human resources.

Horvath, A., **Hautsch, N.:** How Effective are Trading Pauses? Evidence from NASDAQ 2016

Bredendiek, M., **Hautsch, N.**, Turnbull, S.: The Impact of News on Agricultural Commodity Prices.

Perez-Ostafe, L., **Klein, I.,** Cordero, F.: Asymptotic arbitrage in fractional mixed markets.

Bachoc, F.; **Leeb, H.; Poetscher, B.M.:** Valid confidence intervals for post-model-selection predictors, revision for Ann. Statist. *(In preparation)*

Cebiroglu, G., Pohl, M.: The Option Value of a Limit Order and its Implied Volatility. *(In Preparation)*

Pötscher, B., M.; Preinerstorfer, D.: Controlling the Size of Autocorrelation Robust Tests.

Reschenhofer, E.; Sinkovics, T.: Examining the profitability of automatic trading strategies with a focus on trend indicators *(to appear in Quantitative Finance)*

Reschenhofer, E.; Stark, T.: Forecasting the yield curve with dynamic factors *(submitted)*

Steinberger, L.; Leeb, H.: Leave-one-out prediction intervals in linear regression models with many variables, *arXiv:1602.05801*

Steinberger, L.; Leeb, H.: Prediction when fitting simple models to high-dimensional data, revision to Ann. Statist. *(In preparation)*

Sinnl, M., Ljubic, I., **Luipersbeck, M.,** Álvarez-Miranda, E.: Solving Minimum-Cost Shared Arborescence Problems. *European Journal of Operational Research. (Preprint)*

6 Dissemination of Research

Workshops and Conferences

	Conference	Title of Presentation
Immanuel Bomze	XIII Global Optimization Workshop, Braga, Portugal	Finding and analyzing hard instances of the Standard Quadratic Optimization Problem
Immanuel Bomze	EURO2016 - 28th European Conference on Operational Research, Poznan, Poland	Data science, machine learning, ternary and other hard decision problems: how copositive optimization can help
Immanuel Bomze	14th EUROPT Workshop on	The complexity of simple models -

	Advances in Continuous Optimization Warsaw, Poland	a study of worst and typical hard cases for the Standard Quadratic Optimization Problem
Immanuel Bomze	XI Brazilian Workshop on Continuous Optimization, Manaus, Brasil (invited)	Tightening Dual Bounds for QCQPs by Copositivity
Immanuel Bomze	Land - Translog III: Joint Workshop on Location and Network Design - Transportation and Logistic, Santa Cruz, Chile	The Network Design Problem with Relays: Charging Electric Vehicles
Georg Brandstätter	EULOG 2016: Workshop in Honor of R.F. Hartl, Vienna, Austria	On optimally placing charging stations in an electric car sharing network
Georg Brandstätter	VeRoLog 2016: annual workshop of the EURO working group on Vehicle Routing and Logistics optimization, Nantes, France	On finding optimal charging station locations in an electric car sharing system
Georg Brandstätter	ISCO 2016 - 4th International Symposium on Combinatorial Optimization, Vietri sul Mare, Italy	On optimally placing charging stations in an electric car sharing network
Gökhan Cebiroglu	Financial Econometrics and Empirical Asset Pricing Conference : SoFiE Co-sponsored Joint Conference, Lancaster, UK	Volatility, Information Feedbacks and Market Microstructure: A Tale of two Regimes
Gökhan Cebiroglu	9th Annual SoFiE Conference; Hongkong; China	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes
Marek Chudy	Austrian Research and Innovation Talk: Big Data – From Technology & Engineering to Humanities, Toronto, Canada	High Frequency Meets High Dimension: a Story of Big Data
Marek Chudy	Austrian Research and Innovation Talk: Big Data – From Technology & Engineering to Humanities, Toronto, Canada	High Frequency Meets High Dimension: a Story of Big Data
Daniela Debora Escobar	CMS2016 - Computational Management Science 2016, Salamanca, Spain	Analysis of Risk Premia in Energy Markets
Martin Glanzer	Vienna Congress on Mathematical Finance, Austria	Poster Presentation

Walter J. Gutjahr	First EURO Hope mini-conference, Hamburg, Germany	Some Topics in Shelter Location Planning
Nikolaus Hautsch	New Developments in Measuring and Forecasting Financial Volatility, Durham, USA (invited)	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes
Nikolaus Hautsch	Symposium on Financial Engineering and Risk Management (FERM), Guangzhou, China (invited)	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes
Nikolaus Hautsch	Jan Mossin Memorial Symposium on Financial Markets, Bergen, Norway (invited)	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes
Hannes Leeb	Workshop on Model Selection, Leuven, Belgium (invited)	How to justify fitting simple models to high- dimensional data
Martin Luipersbeck	EURO2016 - 28th European Conference on Operational Research, Poznan, Poland	A dual-ascent-based branch-and-bound framework for the prize-collecting Steiner tree and related problems
Martin Luipersbeck	CPAIOR 2016, Banff, Kanada	Optimal Upgrading Schemes for Effective Shortest Paths in Networks
Martin Luipersbeck	ISCO 2016 - 4th International Symposium on Combinatorial Optimization, Vietri sul Mare, Italy	A dual-ascent-based branch-and-bound framework for the prize-collecting Steiner tree and related problems
Georg Pflug	VOCAL Optimization Conference: Advanced Algorithms, Esztergom, Hungary	Bounds and Approximation for Stochastic Optimization Poblems
Georg Pflug	OR2016: International Conference on Operations Research, Hamburg, Germany	Bounds for stochastic multistage optimization problems
Georg Pflug	Data Driven Operations Management, Eindhoven, the Netherlands (Keynote Speaker)	Decision making under uncertainty: data-driven modeling
Georg Pflug	Energy Research Workshop Disentis 2016, Switzerland	Risk premia in energy markets
Georg Pflug	CMS2016 - Computational Management Science 2016, Salamanca, Spain	Optimal insurance design under ambiguity

Benedikt M. Pötscher	Workshop: New Approaches to the Identification of Macroeconomic Models, Oxford University, UK (invited)	Controlling the Size of Autocorrelation Robust Tests
Benedikt M. Pötscher	CREATES, Aarhus University, Denmark (invited)	Controlling the Size of Autocorrelation Robust Tests
Mario Ruthmair	EURO2016 - 28th European Conference on Operational Research, Poznan, Poland	Models for Electric Vehicle Routing Problems with Load-dependent Energy Consumption
Mario Ruthmair	ISCO 2016 - 4th International Symposium on Combinatorial Optimization, Vietri sul Mare, Italy	Flow and Layered Graph Models for the Black-and-White Traveling Salesman Problem
Werner Schachinger	XIII Global Optimization Workshop, Braga, Portugal	Constructing Standard Quadratic Optimization Problems with Many Local Solutions
Markus Sinnl	EURO2016 - 28th European Conference on Operational Research, Poznan, Poland	Decomposition Approaches for Interdiction Problems
Markus Sinnl	18th Conference on Integer Programming and Combinatorial Optimization, Liege, Belgium	Intersection Cuts for Bilevel Optimization
Markus Sinnl	ISCO 2016 - 4th International Symposium on Combinatorial Optimization, Vietri sul Mare, Italy	On Interdiction Problems over Independence Systems
Lukas Steinberger	Workshop on Model Selection, Leuven, Belgium (invited)	Statistical inference when fitting simple models to high-dimensional data
Christopher Walsh	9th International Conference of the ERCIM WG on Computational and Methodological Statistics, Sevilla, Spain (invited)	Analysing dynamic interactions in limit order book markets using nonparametric methods

Outside Seminars

	Institution	**Title of Presentation**

Immanuel Bomze	Koc University, Istanbul, Turkey (invited)	Ternary and other hard decision problems: how copositive optimization can help
Immanuel Bomze	University Trier, Germany (invited)	The role of copositivity in optimality conditions and relaxation bounds
Immanuel Bomze	Maastricht University, the Netherlands (invited)	Copositive Optimization
Immanuel Bomze	Universidad de Sevilla, Spain (invited)	Copositive Optimization
Immanuel Bomze	TU Graz, Austria (invited)	New bounds for the cp-rank in copositive optimization
Georg Brandstätter	Università degli Studi di Bologna, Italy	ILP formulations for finding optimal locations for charging stations in an electric car sharing network
Marek Chudy	University of Pennsylvania, Philadelphia, USA	Portfolio Risk and Asset Allocation: Utilizing high freq. information in high dimensions
Walter J. Gutjahr	WU Vienna, Austria	Bi-objective Bilevel Optimization of Facility Locations Considering User Equilibria
Walter J. Gutjahr	University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Lugano, Switzerland	Bi-objective Bilevel Location Planning with Deterministic and Stochastic User Equilibrium Models
Walter J. Gutjahr	Koc University, Istanbul, Turkey	Bi-objective Bilevel Optimization of Facility Locations under Congestion
Nikolaus Hautsch	University Pompeu Fabra, Barcelona, Spain (invited)	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes
Nikolaus Hautsch	Humboldt-Universität zu Berlin, Germany (invited)	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes
Nikolaus Hautsch	Aarhus University, Denmark (invited)	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes

Nikolaus Hautsch	Commodity Futures Trading Commission, Washington, USA (invited)	Volatility, Information Feedback and Market Microstructure Noise: A Tale of Two Regimes
Nikolaus Hautsch	Banca d'Italia, Italy (invited)	The Hidden Side of the Market: Order Exposure and Liquidity Coordination
Nikolaus Hautsch	Duke University, Durham, North Carolina, USA (invited)	High Speed on Financial Markets – Blessing or Curse?
Nikolaus Hautsch	Karlsruher Institut für Technologie, Germany, (invited)	Revisiting the Stealth Trading Hypothesis – Does Time-Varying Liquidity Explain The Size-Effect?
Georg Pflug	Technical University of Denmark	Stochastic Optimization in Energy
Georg Pflug	Universidade de Santiago de Compostela (USC), Spain	Stochastic Optimization and Approximation
Georg Pflug	Università degli Studi di Bergamo, Italy	Risk Management: Risk measures, ambiguity models and systemic risk
Georg Pflug	University Trier, Germany	Multistage stochastic optimization: Approximation, bounds and ambiguity
Georg Pflug	IMPA - Instituto Nacional de Matemática Pura e Aplicada, Rio de Janeiro, Brasil (invited)	Multistage stochastic programs: Time consistency and martingale bounds
Georg Pflug	Wolfgang Pauli Institute (WPI) Vienna, Austria (invited)	Pricing of electricity contracts
Georg Pflug	University of Warsaw, Poland (invited)	On systemic Risk
Benedikt M. Pötscher	TU Dortmund, Germany (invited)	Manfred Deistler and the Identifiability of Linear Systems (Laudatio anlaesslich der Verleihung des Ehrendoktorats der TU Dortmund an Manfred Deistler)
Lukas Steinberger	Université Toulouse III Paul Sabatier, France (invited)	Statistical inference when fitting simple models to high-dimensional data

Departmental Seminar = ISOR Colloquium

January 11	Holger Dette (Ruhr University Bochum, Germany)	Quantile spectral analysis
January 18	Emanuele Borgonovo (Bocconi University Milano, Italy)	Integral Sensitivity in Linear Programming (joint work with Greg Buzzard and Richard Wendell)
March 7	Johanna Bertl (Aarhus University, Denmark)	Analysis of the mutation rate in whole-genome cancer data to find cancer causing mutations
April 4	Christopher Walsh (University of Vienna, Austria)	Estimating Nonlinear Additive Models with Nonstationarities and Correlated Errors
April 11	Christa Cuchiero (University of Vienna, Austria)	Polynomial Processes in Stochastic Portfolio Theory
April 18	Ariel Neufeld (ETH Zurich, Switzerland)	On Asymptotic Exponential Arbitrage
April 25	Carsten Jentsch (University of Mannheim, Germany)	Asymptotic Theory and Bootstrap Inference for weak VARs and weak Proxy SVARs (joint work with Ralf Brüggemann, Kurt G. Lunsford and Carsten Trenkler)
May 2	Mario Ruthmair (University of Vienna, Austria)	Modeling and Solving Pickup and Delivery Traveling Salesman Problems
May 9	Josef Teichmann (ETH Zurich, Switzerland)	Affine processes and non-linear differential equations (joint work with Georg Grafendorfer and Christa Cuchiero)
May 23	Milos Kopa (Charles University Prague, Czech Republic)	Robustness in stochastic programs with decision dependent randomness
May 30	James Duffy (University of Oxford, UK)	Limit theory for functionals of linear processes at the boundary of non-stationarity (joint work with I. Kasparis)
June 6	Andres Santos (UC San Diego, USA)	Inference on Directionally Differentiable Functions
June 13	Daniel Kuhn (EPFL Lausanne, Switzerland)	Ambiguous Joint Chance Constraints under Mean and Dispersion Information
June 20	Piotr Jaworski	On systemic risk and Conditional Value at Risk

	(University of Warsaw, Poland)	(CoVaR)
October 3	Michael Vogt (University of Bonn, Germany)	Classification of Nonparametric Regression Functions in Longitudinal Data Models
October 10	Ruud Teunter (University of Groningen, the Netherlands)	How to include forecast errors in inventory control: why existing methods are flawed
October 17	Rudy Beran (UC Davis, USA)	Hypercube Fits to the Multivariate Linear Model
October 24	Søren Johansen (University of Copenhagen, Denmark)	Optimal hedging with the cointegrated vector autoregressive model allowing for heteroscedastic errors
October 31	Bernardo Pagnoncelli (UAI, Santiago de Chile)	Multistage Stochastic Programming: A Modeling and Algorithmic Perspective
November 7	Philipp Hungerländer (Alpen Adria Universität Klagenfurt, Austria)	The Traveling Salesman Problem on Grids with Forbidden Neighborhoods
November 14	Claudia Plant (University of Vienna, Austria)	Information-theoretic Clustering for Neuroscience Applications
November 21	Justo Puerto (Universidad de Sevilla, Spain)	A fresh view on k-sum optimization and the Discrete Ordered Median Problem: A general framework
November 28	Volker Schulz (University Trier, Germany)	New Results on Optimization in Shape Manifolds
December 5	Jacek Gondzio University of Edinburgh, UK)	Continuation in Optimization: From interior point methods to Big Data
December 12	Panayotis Mertikopoulos (CNRS, Grenoble, France)	On the convergence of gradient-like flows with noisy gradient input (joint work with M. Staudigl)

7 Grants and Externally Funded Research Projects

Immanuel Bomze (Project-Coordinator, taken over from Ivana Ljubic in 09/2015) Research Associates: Markus Sinnl	Title: Network Optimzation in Bioinformatics and Sytems Biology Funding: FWF Runtime: 2014-2019

Hannes Leeb (Principal Investigator), Research Associates: Ivana Milovic, Lukas Steinberger	Title: Model selection and inference with sparse models when the true model need not be sparse Funding: FWF Runtime: 2015- 2017
Hannes Leeb (Principal Investigator), Research Associate: Nina Senitschnigg (on maternity leave)	Title: Shrinkage estimators for prediction out-of-sample Funding: FWF Runtime: 2014-2016
Markus Leitner (Project-Coordinator), Research Associates: Georg Brandstätter	Title: Models for Ecological, Economical, Efficient, Electric Car-Sharing (e4-share) Funding: FFG (via Joint Programming Initiative Urban Europe) Runtime: 2014-2017
Markus Leitner (Principal Investigator), Research Associates: Mario Ruthmair	Title: Optimization and Analysis of Large-Scale Networks Funding: WWTF Runtime: 2015-2018
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) – Doktoratskolleg Funding: FWF Runtime: 2016-2020
Georg Pflug (Project-Coordinator) Research Associates: Andreas Wittmann	Title: Risk Capital Reserves for Flood Catastrophes in National and European Context Funding: Jubliäumsfonds der Österreichischen Nationalbank Runtime: 2014-2018
Benedikt M. Pötscher (Principal Investigator)	Title: Autocorrelation Robust Testing in Regression Models Funding: FWF Runtime: 2015-2016
Walter Schachermayer (Project-Coordinator), **Georg Pflug** (Co-	Title: Portfolio Risk and Asset Allocation - Utilizing High-Frequency Information in High Dimensions

Investigator), **Nikolaus Hautsch** (Co-Investigator)
Research Associates: **Mathias Pohl**, **Alexander Ristig**, Ludovic Tangpi

Funding: WWTF
Runtime: 2015-2019

8 Research Stays at Other Institutions

	Institution	Topics	Weeks
Irene Klein	ETH Zurich, Switzerland	Large financial markets with restricted information	1
Markus Leitner	Universitat Politècnica de Catalunya, Spain	Arc routing	1
Markus Leitner	Université Libre de Bruxelles, Belgium	Project Meeting e4-share, cooperation with B. Fortz	1
Georg Pflug	Freie Universität Bozen, Italy	Systemic Risk	1

9 Other Faculty Activities

Editorial Work

Immanuel Bomze

Editor
- European Journal of Operational Research

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

Walter Gutjahr

Associate Editor
- OR Spectrum
- Central European Journal of Operations Research

Member of Editorial Board
- Production and Operations Management
- Swarm Intelligence
- EURO Journal on Decision Processes

Nikolaus Hautsch

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

Member of Editorial Board
- Econometrics

Hannes Leeb

Associate Editor
- Sankhya: Indian Journal of Statistics

Georg Pflug

Associate Editor
- Computational Optimization and Applications
- Computational Management Science
- Central European Journal of OR
- Austrian Journal of Statistics
- Energy Systems: Optimization, Modeling, Simulation and Economic Aspects
- Operations Research
- Journal of Stochastic Analysis

Member of Editorial Board
- Financial Mathematics and Applications

Benedikt M. Pötscher

Co-Editor of
- Econometric Theory

Associate Editor of
- Journal of Statistical Planning and Inference

Refereeing

Walter J. Gutjahr

- Applied Soft Computing (1)
- Central European Jounal of Operations Research (1)
- Computers and Industrial Engineering (1)
- Computers and Operations Research (3)
- European Journal of Operational Research (4)
- Informs Journal on Computing (1)
- International Transactions in Operational Research (1)
- Journal of the Operations Research Society (1)
- Networks (1)
- Operations Research (1)
- Production and Operations Management (1)
- Surveys in Operations Research and Management Science (1)
- Transactions on Evolutionary Computation (2)
- Transportation Research Part E (2)
- Transportmetrica B (1)

	Refereeing of Research Projects: ▪ Swiss National Science Foundation (1) ▪ Czech Science Foundation (1)
Nikolaus Hautsch	▪ Journal of Econometrics (3) ▪ Journal of Business & Economic Statistics ▪ Journal of Banking and Finance ▪ Journal of Applied Econometrics (2) ▪ Journal of Finance ▪ Mathematics and Financial Economics ▪ Economic Modeling
Irene Klein	▪ Bernoulli Journal (1) ▪ Journal of mathematical Analysis and Applications (1)
Hannes Leeb	▪ Journal of the American Statistical Association (1) ▪ Annals of Statistics (2) ▪ Journal of Statistical Planning and Inference (1)
Benedikt M. Pötscher	▪ Biometrika ▪ Journal of the American Statistical Association ▪ Quantitative Economics ▪ Statistical Science
Werner Schachinger	▪ Linear Algebra and its Applications

Other Professional Activities

Immanuel Bomze	▪ Deputy Director of Studies PhD Program, University of Vienna, Austria
Walter J. Gutjahr	▪ Program Committee Member ANTS 2016 ▪ Program Committee Member EvoCOP 2017 ▪ Program Committee Member GECCO 2016 ▪ Program Committee Member Matheuristics 2016 ▪ Program Committee Member PPSN 2016
Nikolaus Hautsch	▪ Vice Dean of the Faculty of Business, Economics and Statistics, University of Vienna, Austria
Irene Klein	▪ Head of Department (Statistics and Operations Research), University of Vienna, since October 2016 ▪ Co-Organizer: Vienna Congress on Mathematical Finance, Vienna, Austria
Hannes Leeb	▪ Head of Department (Statistics and Operations Research), University of Vienna, until September 2016 ▪ Bernoulli Society European Regional Committee

	▪ Bernoulli Society ERC Conference Committee
Georg Pflug	▪ Speaker of the Vienna Graduate School on Computational Optimization ▪ Member FWF-Kuratorium (Applied Mathematics) ▪ Chair/Speaker of Faculty Board at the Faculty of Business, Economics and Statistics, University of Vienna ▪ Advisory Board CMS 2016 (Universidad Rey Juan Carlos, Madrid, Spain) ▪ Scientific Committee OR2016 (International Conference on Operations Research)
Erhard Reschenhofer	▪ Deputy Director of Studies Programme Business, Economics and Statistics (University of Vienna), since October 2016
Werner Schachinger	▪ Deputy Director of Studies Programme Business, Economics and Statistics (University of Vienna), until September 2016