Dr. Mario P. Rothfelder

Contact Details

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Research Interests

Primary	Statistical Foundations of Machine Learning • High-Dimensional Econometrics • Time Series Econometrics
Secondary	Econometrics of Networks

Academic Positions

2018–Present	Postdoctoral Research Fellow • Tilburg University NWO RATE analytics project “Next generation predictive analytics for data-driven banking and insurance” • Collaboration between Rabobank, Achmea, Tilburg University and Technical University Eindhoven

Education

2013–2018	PhD • Tilburg University
Thesis	Three Essays on Time-Varying Parameters and Time-Series Networks
Advisers	Prof. Dr. Bas J.M. Werker • Dr. Otilia Boldea
Committee	Prof. Dr. André Lucas • Prof. Dr. Bertrand Melenberg • Dr. Andreas Pick • Dr. Nikolaus Schweizer
Date of Defense	16.03.2018
2011–2013	M.Sc. Economics (Research) • Tilburg University with distinction • Major in Econometrics • Minor in Empirical IO
2010–2011	M.Sc. Econometrics and Mathematical Economics • Tilburg University with distinction • Major in Econometrics
2007–2010	B.Sc. Mathematical Finance • University of Konstanz
2006–2010	B.Sc. Economics • University of Konstanz Major in Quantitative Economics

Working Papers

Title Estimating Sparse Long-Run Precision Matrices of Multivariate Time Series (Job Market Paper)

Status In preparation for submission

Abstract Sparsity patterns of inverses of long-run covariance matrices (also known as precision matrices) are of direct use to practitioners, as they can be directly linked to the presence and strength of the connections in time series networks such as financial networks. The current literature is not able to recover these sparsity patterns, because is typically estimates the long-run covariance matrix, then inverts it, resulting in non-sparse inverses. In this article, I propose a novel estimator that directly obtains a sparse long-run precision matrix of a multivariate, mean zero time series. The proposed estimators minimize the ℓ_1-penalized log-likelihood function of an $i.i.d.$ mean-zero normal random vector, resulting in an (adaptive) LASSO estimator. This is possible by reinterpreting the log-likelihood function as a special case of the Bregman-divergence.

I derive the asymptotic distribution of both, the LASSO- and adaptive LASSO estimators and show that the latter enjoys the oracle property of Zou (2006). That is, the adaptive LASSO estimator chooses the non-zero entries correctly with probability tending to one and the estimates for the non-zero entries have the same distribution as the oracle estimator.

An extensive simulation study shows that both the LASSO and the adaptive LASSO estimators perform well in small samples, and that the latter recovers the true sparsity pattern in the data.

Title Testing for a Threshold in Models with Endogenous Regressors

Co-Author Otilia Boldea

Status Submitted

Abstract We propose two new parametric tests for an unknown threshold in models with endogenous regressors. They are both based on unconventional 2SLS estimators that use additional information about the linearity of the first stage. This information leads to more accurate residuals and therefore tests with better size properties than the Wald GMM test in Caner and Hansen (2004), which we show exhibits severe size distortions in small samples pertinent to empirical applications.

We prove the bootstrap validity of our tests and evaluate their empirical relevance by revisiting the question whether government spending multipliers are larger in recessions. As Ramey and Zubairy (2018), we cannot rule out that they are the same in recessions or expansions.

Ongoing Projects and Work in Progress

Title Random Forests with Oblique Splits

Description Together with Otilia Boldea and Bas Werker, I generalize random trees and forests for binary classification tasks by allowing splits to be performed on linear combinations of the regressors, rather than individual regressors. This generalization is useful as many applications in both micro-econometrics and time series use indexes or unobserved factors as explanatory variables, and these indexes or factors are typically constructed as linear combinations of observed variables. We provide theoretical results on consistently estimating conditional choice probabilities. Moreover, splitting on linear combinations can be expected to provide smaller trees which are easier to interpret. We show under which conditions the model for choice probabilities or continuous outcomes can be consistently estimated with the generalized random forest approach that we propose.

Title Estimation of High-Dimensional Long-Run Covariance and Precision Matrices

Description Within this project, I extend the framework in “Estimating Sparse Long-Run Precision Matrices of Multivariate Time Series” by allowing the number of multivariate time series to grow with the sample size. The estimation framework is the same as in the aforementioned working paper. However, several considerations have to be taken into account. For one, the underlying theoretical framework itself since the main arguments of the proofs, compared to the case of a fixed number of multivariate series, change substantially. Moreover, as in any kernel estimation scheme, the bandwidth choice is of crucial importance for achieving good computational results. However, the optimal bandwidth choice, commonly obtained by minimising the mean square error, suffers from the curse of dimensionality, since the mean square error scales with a power of four compared to the number of individual series considered in the underlying multivariate time series. Hence, I also investigate how the optimal bandwidth can efficiently be chosen in such a setting.

Title Robustness of Empirical Networks to Different Sampling Schemes

Description In practice, nodes of a networks are usually sampled from a population set of nodes and it is known that network measures, such as in- and out degrees, can be biased, depending on the sampling scheme. However, this effect is usually overlooked in the empirical literature on economic and financial networks and therefore, these results have to be taken with a grain of salt. Motivated by this, I want to understand how particular sampling schemes affect certain network structures commonly used in the empirical financial literature, thereby understanding to what degree current empirical results are affected by this circumstance. To achieve this, I am currently investigating empirical applications by comparing their outcomes after exclusion of certain nodes, such as Lehman Brothers in financial networks. For the future, I plan to conduct an extensive simulation study to further investigate the effects of different sampling schemes on potential biases in the network structure. I thereby hope to provide some guidance in which direction empirical results should be interpreted and what potential biases need to be accounted for.

Conferences and Seminars

2020 University of Amsterdam • University of Groningen • Catholic University of Leuven • University of Glasgow • University of Bristol • World Congress of the Econometric Society (Milan; Online)

2019 VU Amsterdam Econometrics Seminar • European Winter Meeting of the Econometric Society (Rotterdam)

2018 German Probability and Statistics Days (Freiburg) • NESG Meeting (Amsterdam) • Bristol Econometric Study Group Meeting (Bristol)

2016 European Summer Meeting of the Econometric Society (Geneva)

2015 NESG Meeting (Maastricht) • Bristol Econometric Study Group Meeting • IAAE Conference (Thessaloniki) • NBER-NSF Time Series Conference (Vienna) • Econometrics Brown Bag Seminar

2014 NESG Meeting (Tilburg) • Econometrics Brown Bag Seminar

Teaching and Thesis Supervision

2018–Present Time Series and their Applications
M.Sc. Econometrics and Mathematical Economics • Tilburg University • Lecturer

2018–present Thesis Supervision
M.Sc. Econometrics and Mathematical Economics • M.Sc. Business Analytics and Operations Research • Tilburg University • 1^{st} and 2^{nd} Reader

2015–2017 Econometrics 3
M.Sc. Economics (Research) • Tilburg University • Teaching Assistant

2013–2016 Panel Data Analysis of Microeconomic Decisions
M.Sc. Econometrics and Mathematical Economics • Tilburg University • Teaching Assistant

2013 Mathematics 1
B.Sc. IBA • Tilburg University • Teaching Assistant

2012–2016 **Microeconometrics**
M.Sc. Econometrics and Mathematical Economics • Tilburg University • Teaching Assistant

2008–2009 **Mathematics 1 for Economists**
B.Sc. Economics • University of Konstanz • Teaching Assistant

2008–2010 **Mathematics 2 for Economists**
B.Sc. Economics • University of Konstanz • Teaching Assistant

Research and Work Experience

2009–2010 **Research Assistant**
to Prof. Dr. Carlos Alós-Ferrer • University of Konstanz

August/September 2008 **Research Assistant**
Halle Institute for Economic Research (Member of the Leibniz Association) • Halle a.d. Saale

University Services and Activities

2014–2015 Organizer Econometrics Brown Bag Seminar • Tilburg University

2013–2017 Participant in the Econometrics Game for Tilburg Unviersity

2013–2014 Participant in Big Data/Machine Learning Reading Group • Tilburg University

Additional Information

Software Circos • Dataiku • EViews • GRETL • Julia • LaTeX • Matlab • Python • R • Stata • TensorFlow

OS Linux • Windows

References

Prof. Dr. Bas J.M. Werker
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Dr. Otilia Boldea
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Prof. Dr. Bertrand Melenberg
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Prof. Dr. André Lucas
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