econometrics

MDPI

Editorial

Introduction to the Special Issue "High-Dimensional Time Series in Macroeconomics and Finance"

Benedikt M. Pötscher [1], Leopold Sögner [2] and Martin Wagner [2,3,4,*]

[1] Department of Statistics and Operations Research, University of Vienna, Oskar Morgenstern Platz 1, 1090 Vienna, Austria; benedikt.poetscher@univie.ac.at
[2] Institute for Advanced Studies, Josefstädter Straße 39, 1080 Vienna, Austria; soegner@ihs.ac.at
[3] Department of Economics, University of Klagenfurt, Universitätsstrasse 65-67, 9020 Klagenfurt, Austria
[4] Bank of Slovenia, Slovenska 35, 1000 Ljubljana, Slovenia
* Correspondence: Martin.Wagner@aau.at

This Special Issue was organized in relation to the fifth Vienna Workshop on High-Dimensional Time Series in Macroeconomics and Finance, which took place at the Institute for Advanced Studies in Vienna on 9 June and 10 June 2022. The workshop gathered about seventy researchers from fourteen countries with about 50 presentations. The workshop was dedicated to celebrating the 80th birthday of Manfred Deistler, who has been affiliated with the Institute for Advanced Studies since his days as a postgraduate student. Manfred Deistler has been working on factor models, amongst other topics (often related to identification) for many years. Prior to contributing to generalized dynamic factor models more recently, he performed important work on errors-in-variables models that are, as is potentially not known widely enough, closely related to factor models. We abstain from providing Manfred's CV and list of publications here and refer the reader to the *Econometric Theory* interview that was conducted in 2006 by Benedikt Pötscher (Pötscher 2007).

Two of the papers in this Special Issue discuss Manfred's (and his co-authors') contributions to the factor model literature. The paper "Manfred Deistler and the General-Dynamic-Factor-Model Approach to the Statistical Analysis of High-Dimensional Time Series" by Marc Hallin reviews important conceptual and modeling choices contributing to the success of (generalized dynamic) factor models by alleviating some of the problems plaguing fixed but finite cross-section dimension approaches to high-dimensional time series. After that, the paper reviews some of Manfred's key contributions—based on collaboration with his long-time coauthor and friend, Brian D.O. Anderson—to the, by now famous and widely-used, result on rational tall transfer functions corresponding generically to autoregressive rather than autoregressive moving average systems. This result, as the paper discusses, has several important implications for estimation and inference in generalized dynamic factor models, including structural analysis. The paper "Linear System Challenges of Dynamic Factor Models" by Brian D.O. Anderson, Manfred Deistler, and Marco Lippi also provides a survey of work that Manfred has been involved in. The distinguishing feature of this survey paper is its inclusion of discussions on the computational aspects as well as on the challenges arising from mixed-frequency observations, a very common setting in many applications, particularly in macroeconomics. The paper also discusses, from a different perspective, the above-mentioned genericity result on tall transfer functions corresponding generically to autoregressive systems.

The remaining four papers in this Special Issue are not directly related to Manfred's work but address a wide selection of problems arising in high-dimensional time series, both classical and Bayesian and from both a theoretical and an empirical perspective. The paper "When It Counts—Econometric Identification of the Basic Factor Model Based on GLT Structures" by Sylvia Frühwirth-Schnatter, Darjus Hosszejni, and Hedibert Freitas Lopes is on Bayesian factor analysis. Classical problems in factor analysis are the rotational invariance problem and variance identification (see, e.g., Anderson and Rubin 1956). This article

check for updates

Citation: Pötscher, Benedikt M., Leopold Sögner, and Martin Wagner. 2024. Introduction to the Special Issue "High-Dimensional Time Series in Macroeconomics and Finance". *Econometrics* 12: 6. https://doi.org/10.3390/econometrics12010006

Received: 29 December 2023
Accepted: 24 January 2024
Published: 22 February 2024

introduces identification by means of generalized lower triangular (GLT) structures, where the authors demonstrate that by using generalized lower triangular structures identification is unique and can be obtained under less restrictive assumptions than applying the positive lower triangular approach. A counting rule is introduced which relates to row-deletion (going back to Anderson and Rubin 1956), and thus allows for variance identification under GLT structures. The authors show how to implement these results in a Bayesian sampler and how to estimate the number of factors. A simulation study shows the advantages of the proposed approach. Finally, the Bayesian methods developed in this article are applied to investigate common behavior of U.S. stock market returns.

The paper "Factorization of a Spectral Density with Smooth Eigenvalues of a Multidimensional Stationary Time Series" by Tamás Szabados provides sufficient conditions for the regularity of a multivariate weakly stationary process, including the case where the spectral density is rank-deficient, which is an important case in some applications, e.g., in factor model applications.

The paper "Modeling COVID-19 Infection Rates by Regime-Switching Unobserved Components Models" by Paul Haimerl and Tobias Hartl considers an unobserved components model. The goal of their analysis is to decompose a time series into a trend, a seasonal component, and a stationary cyclical component, where the decomposition is allowed to depend on a finite and usually small number of states. To perform parameter estimation, the authors maximize the likelihood, which is derived by applying an augmented version of a Kalman filter allowing for regime switching (see, e.g., Kim 1994). The methodology is applied to daily U.S. COVID-19 infection data, where the model infers regime changes close to arrivals of new variants of the COVID-19 virus and policy interventions.

The paper "Causal Vector Autoregression Enhanced with Covariance and Order Selection" by Marianne Bolla et al. introduces so-called "causal VARs", which are structural vector autoregressive models where the matrix describing the contemporaneous structure is derived from a directed acyclical graph. The paper shows how the structural parameters can be obtained from the second moments of the autoregressive process. The paper also discusses methods to select the order of the autoregressive model. The paper closes with applications to financial data as well as to data on infant mortality.

Conflicts of Interest: The authors declare no conflict of interest.

References

Anderson, Theodore W., and Herman Rubin. 1956. Statistical inference in factor analysis. In *Proceedings of the Third Berkeley Symposium on Mathematical Statistics and Probability, Volume 5: Contributions to Econometrics, Industrial Research, and Psychometry*. Edited by Jerzy Neyman. Berkeley: University of California Press, pp. 111–50.

Kim, Chang-Jin. 1994. Dynamic linear models with Markov-switching. *Journal of Econometrics* 60: 1–22. [CrossRef]

Pötscher, Benedikt M. 2007. The ET interview: Professor Manfred Deistler: Interviewed by Benedikt M. *Pötscher. Econometric Theory* 23: 711–48. [CrossRef]