ECONOMETRICS, TIME SERIES ANALYSIS, AND SYSTEMS THEORY

A CONFERENCE IN HONOR OF MANFRED DEISTLER

BASIC INFORMATION

Date:	June 18 - 20, 2009
Location:	Institute for Advanced Studies, Vienna, Austria
Organizers:	Benedikt M. Pötscher (University of Vienna) Wolfgang Scherrer (Vienna University of Technology) Martin Wagner (Inst. for Advanced Studies)
Description:	The purpose of this conference is to celebrate Manfred Deistler's scientific achievements over a lifetime devoted to academic research and teaching at the occasion of his retirement from the Vienna University of Technology.

SCIENTIFIC PROGRAM

The conference will consist of a series of invited and contributed presentations. The scope of the program is intended to cover the wide range of Manfred Deistler's scientific activities. Therefore this invitation is posted to people from the econometric, time series analysis and system theory scientific communities. We hope that the conference will serve as an opportunity for a fruitful exchange of ideas.

The invited speakers are: Brian D.O. Anderson (Australian National University), Laurent Baratchart (INRIA Sophia Antipolis), A. Ronald Gallant (Duke University), Michel Gevers (Université Catholique de Louvain), Marco Lippi (University of Rome – La Sapienza), Ingmar Prucha (University of Maryland), and Peter M. Robinson (London School of Economics).

THURSDAY JUNE 18, 2009

08:00-08:45 **Registration, in front of HS2**

08:45-09:00 **Opening Session, HS2**

09:00-10:00 **Invited Session Th.I1, HS2** — Chair: László Gerencsér

Brian D O Anderson — Australian National University
Multivariable zero-free transfer functions and spectra, and their application in economic modelling

10:05-11:20 **Contributed Session Th.C1a, HS2** — Chair: Michele Pavon

Rainer Dahlhaus — Universität Heidelberg
Phase Estimation for Fluctuation Processes

Suhasini Subba Rao — Texas A&M University
A frequency domain approach to stochastic coefficient regression models

Michele Pavon — Università di Padova
Hellinger distance for multivariate spectrum estimation

10:05-11:20 **Contributed Session Th.C1b, SZ VI** — Chair: Wolfgang Polasek

G Tunnicliffe Wilson — Lancaster University
Empirical linear models for multivariate continuous time processes

Shin-Huei Wang — Universite Catholique de Louvain
The Real Time Monitoring Test for Long Run Behavior of Stock Returns

Wolfgang Polasek — Institute for Advanced Studies, Vienna
Autoregressive Space-time (ARST) Models for Spatial Forecasting

11:20-11:45 **Coffee Break**

11:45-12:45 **Invited Session Th.I2, HS2** — Chair: Werner Ploberger

Marco Lippi — Università di Roma La Sapienza
Autoregressive Models with a Countable Infinity of Variables

12:45-14:45 **Lunch Break**

14:45-16:00 **Contributed Session Th.C2a, HS2** — Chair: Sylvia Kaufmann

Liqun Wang — University of Manitoba
Identifiability and Estimation in Nonlinear Systems with Errors-in-Variables

Michael Eichler — University of Maastricht
Fitting dynamic factor models to non-stationary time series

Sylvia Kaufmann — Oesterreichische Nationalbank, Vienna
Dynamic sparse factor model

14:45-16:25 **Contributed Session Th.C2b, SZ VI** — Chair: Massimo Franchi

Stéphane Gregoir — EDHEC Business School
An alternative framework for univariate and multivariate seasonal adjustment

Tommaso Proietti — University of Rome "Tor Vergata"
Hyper-spherical and Elliptical Stochastic Cycles

Robert M. Kunst — Institute for Advanced Studies, Vienna
Testing for seasonal unit roots in monthly panels using parametric and nonparametric tests, with an application to tourism data

Massimo Franchi — University of Insubria
A representation of vector autoregressive processes with common cycles

16:25-16:50 **Coffee Break**

16:50-17:50 **Invited Session Th.I3, HS2** — Chair: Keith Knight

Ingmar Prucha — University of Maryland
Limit Theory for Panel Data Models with Cross Sectional Dependence and Sequential Exogeneity

FRIDAY JUNE 19, 2009

09:00-10:00 **Invited Session Fr.I1, HS2** — Chair: Timothy J. Vogelsang

A. Ronald Gallant — Duke University
Habit, Long Run Risk, Prospect?

10:05-11:45 **Contributed Session Fr.C1a, HS2** — Chair: Hajo Holzmann

Rudolf Kalman — ETH Zurich
Why Probability?

Jan Mutl — Institute for Advanced Studies, Vienna
Panel VAR Models with Spatial Dependence

Timothy J. Vogelsang — Michigan State University
Heteroskedasticity, Autocorrelation, and Spatial Correlation Robust Inference in Linear Panel Models with Fixed-Effects

Hajo Holzmann — Philipps-Universität Marburg
Feasible methods for testing for regime switching

10:05-11:45 **Contributed Session Fr.C1b, SZ VI** — Chair: Ulrike Schneider

Andreas Pick — University of Cambridge
Forecasting Random Walks under Drift Instability

Peter A. Zadrozny — Bureau of Labor Statistics, Washington
Weighted-Covariance Factor Decomposition of VARMA Models Applied to Forecasting quarterly U.S. GDP at Monthly Intervals

Gerold Petritsch — e&t, Vienna
Analysis and Forecasting Hourly Prices in the European Electricity Market

Ulrike Schneider — University of Vienna
On the Distribution of the Adaptive LASSO Estimator

11:45-12:10 **Coffee Break**

12:10-13:10 **Invited Session Fr.I2, HS2** — Chair: Rainer Dahlhaus

Peter M Robinson — London School of Economics
Nonparametric Trending Regression with Cross-Sectional Dependence

13:10-15:00 **Lunch Break**

15:00-16:00 **Panel Discussion "Econometrics and Systems Theory – Quo Vadis?", HS2**

Chair:
G Tunnicliffe Wilson — Lancaster University

Panel:
Brian D O Anderson — Australian National University
Manfred Deistler — Vienna Universtity of Technology
Bart De Moor — K.U. Leuven
A. Ronald Gallant — Duke University

16:15 **Departure for Excursion**

We will visit the Stift Klosterneuburg and take a guided tour which leads into the monastery church, through the medieval cloisters, the fountain house (Brunnenhaus) and to the medieval exhibition space.

19:00 **Conference Dinner**

The conference dinner will take place at the Mayer am Pfarrplatz which is one of the famous Viennese Heurigen.

SATURDAY JUNE 20, 2009

09:00-10:00 **Invited Session Sa.I1, HS2** — Chair: Jan Maciejowski

Laurent Baratchart — INRIA, Sophia Antipolis
Differential Consistency for Linear Models

10:05-11:20 **Contributed Session Sa.C1a, HS2** — Chair: Alex Trindade

László Gerencsér — MTA SZTAKI, Budapest
Recursive estimation GARCH processes

Mika Meitz — University of Oxford
Parameter estimation in nonlinear AR–GARCH models

Alex Trindade — Texas Tech University
Time Series Models With Asymmetric Laplace Innovations

10:05-11:20 **Contributed Session Sa.C1b, SZ VI** — Chair: Katarzyna Lasak

Keith Knight — University of Toronto
Cointegration Testing With Infinite Variance Noise

Thomas Ribarits — European Investment Bank
Co-integration and Interest Rates – The State-Space Error-Correction Model

Katarzyna Lasak — University of Aarhus
Fractional cointegration rank estimation

11:20-11:45 **Coffee Break**

11:45-12:45 **Invited Session Sa.I2, HS2** — Chair: Jan H. van Schuppen

Michel Gevers — Université Catholique de Louvain
Identifiability, informativity, information matrix and the prediction error criterion: a new look at the connections

12:45-14:45 **Lunch Break**

14:45-16:25 **Contributed Session Sa.C2a, HS2** — Chair: Willa W. Chen

Laimonis Kavalieris — University of Otago
Model selection in time series using penalty function criteria

Werner Ploberger — Washington University in St. Louis
Admissibility Properties of Estimators Based on Order Estimation Procedures

Peter E. Caines — McGill University, Montreal
Estimation and Adaptation in Mean Field (Nash Certainty Equivalence) Large Population Stochastic Dynamic Games

Willa W. Chen — Texas A&M University
Unified inference for local-to-unity, moderate deviations from unity and fixed point autoregressive processes

14:45-16:25 **Contributed Session Sa.C2b, SZ VI** — Chair: Isabel Casas

Pieter W. Otter — University of Groningen
State Space Modelling of Dynamic Factor Structures, with an application to the U.S. term structure

Leopold Sögner — Institute for Advanced Studies, Vienna
Term Structure Estimation and Highly Persistent Processes in a Bayesian Context

S. Devin — University College Cork
A comparative study of an arbitrage–free interest rate model and a projected dynamic Nelson Siegel model

Isabel Casas — CREATES, Aarhus University
Short–term interest rates volatility estimation with nonparametric local regression

16:30-16:40 **Closing Session, HS2**

16:40-17:00 **Coffee Break**

Multivariable zero-free transfer functions and spectra, and their application in economic modelling

Brian D O Anderson

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ABSTRACT

Central banks and funds investment managers work with mathematical models. In recent years, a new class of model has come into prominence-generalized dynamic factor models. These are characterized by having a modest number of inputs, corresponding to key economic variables and industry-sector-wide variables for central banks and funds managers respectively, and a large number of outputs, economic time series data or individual stock price movements for example. It is common to postulate that the input variables are linked to the output variables by a finite-dimensional linear time-invariant discrete-time dynamic model, the outputs of which are corrupted by noise to yield the measured data. The key problems faced by central banks or funds managers are model fitting given the output data (but not the input data), and using the model for prediction purposes.

These are essentially tasks usually considered by those practicing identification and time series modelling. Nevertheless there is considerable underlying linear system theory. This flows from the fact that the underlying transfer function matrix is tall.

This presentation will describe a number of consequences of this seemingly trivial fact. For example, a tall transfer function of known McMillan degree but otherwise generic has no zeros, finite or infinite. A finite sequence of output data in the discrete time case allows recovery of a finite sequence of input data, without knowledge of the initial state. Canonical state-variable forms take on a special structure, with the number of real parameters growing linearly with the number of outputs, rather than, as usual, quadratically.

Differential Consistency for Linear Models

Laurent Baratchart

INRIA, Sophia Antipolis

ABSTRACT

One of the early achievements in linear identification was the consistency theorem, asserting that maximum-likelihood type estimators converge asymptotically to the best model out of the model class of finite dimensional linear systems. After some preliminary attempts on compact subsets of the model class, the result was established in full by M. Deistler and T. Hannan. We shall consider an improvement of this theorem, the differential consistency, that claims convergence not just of the minimizing model but also of the critical points of the likelihood criterion; this improvement is joint work with M. Deistler. Based on this result, which states asymptotics for the phase portrait of the gradient vector field of the criterion, and based on the asymptotic form of the likelihood, the question of unimodality (i.e. uniqueness of a local minimum) reduces to semi-classical questions in approximation theory. This question is of basic relevance from the numerical viewpoint, but it is quite complex. We shall present known results, some where the model belongs and some where the model does not belong to the model class, some of the positive and some of the negative type. We will also give new estimates recently obtained for transfer functions that are Cauchy integrals of complex measures on analytic arcs; these are joint work with M. Yattselev and the author. Finally, we shall comment on the case where the spectral density has a mild singularity on the unit circle, and touch upon the issue of input design in connection with unimodality.

Estimation and Adaptation in Mean Field (Nash Certainty Equivalence) Large Population Stochastic Dynamic Games

Peter E. Caines

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Montreal, QC, Canada

ABSTRACT

We consider large population stochastic dynamic games which we analyse using the Mean Field (Nash Certainty Equivalence) methodology (Huang, Caines, Malhame, IEEE TAC, Sept. 2007); this yields a set of decentralized controls for the collection of agents which generates an $\varepsilon-$ Nash equilibrium for the population with ε going to zero as the population goes to infinity. A key feature of the mean field theory is that the resulting control law u_k of the $k-$th agent depends only upon that agent's state and the precomputable population mean trajectory of the collection of the mass of agents, this mean being generated by the collective effect of the individual applications of the NCE control law. In this talk we present initial results (work with Arman Kizikale, McGill) on the extension of this theory to the case where each agent estimates its own dynamical parameters and the distribution of the dynamical parameters of the overall population of agents.

Short–term interest rates volatility estimation with nonparametric local regression

Isabel Casas and Irene Gijbels

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Keywords: Interest rates, nonparametric estimation, structural breaks.

ABSTRACT

The short–term interest rates are modelled by a stochastic differential equation of the form:

$$dr(t) = \mu(t, r(t))dt + \sigma(t, r(t))dB(t)$$

where $\mu(t, r(t))$ is the drift function, $\sigma(t, r(t))$ is the instantaneous volatility and $B(t)$ is a standard Brownian motion. The objective of this paper is to develop a nonparametrical technique to estimate the drift and volatility functions when these functions are very general, and might present discontinuities through time. This scenario is well suited to the field of short–term interest rates where structural breaks occur. Previous literature in nonparametric estimation does not include structural breaks caused by discontinuities in the volatility function. This paper aims to cover this gap, extending previous work from Gijbels et al. (2007) in jump preserving nonparametric techniques.

Unified inference for local-to-unity, moderate deviations from unity and fixed point autoregressive processes

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ABSTRACT

Inference in autoregressive processes is known to be very problematic due to the fact that the t-statistic and the likelihood ratio test (LRT) are not well approximated by their asymptotic distributions uniformly over the parameter space. We consider instead inference based upon the Restricted LRT (RLRT) using the Restricted Likelihood, which has small Efron curvature and hence promises to deliver better behaved inference. The asymptotic distribution of the RLRT for the sum of the AR coefficients is obtained under local-to-unity, moderate deviations from unity, as well as fixed-point parametrisations. The local-to-unity distribution is shown to be very close to the fixed-point chi-square asymptotic distribution and dominated by it, while the moderate-deviations-from-unity asymptotic distribution is exactly chi-square. Hence, inverting the RLRT statistic based on the chi-square approximation provides either accurate or mildly conservative inference over the entire parameter space. The resulting confidence intervals are found to have smaller lengths than the corresponding bootstrap based intervals and the associated unit root test has power that almost matches the power envelope.

Phase Estimation for Fluctuation Processes

Rainer Dahlhaus and Jan C. Neddermeyer

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Universität Heidelberg

ABSTRACT

We introduce a new class of stationary time series models. The aim is to model time series with a specific fluctuation pattern but an unobserved phase process in the background. The goals are to estimate the unknown phase process and the fluctuation pattern. An example is the curve of an electrocardiogram recording. The model can be written as a general state-space model treating the phase, amplitude, and baseline as latent Markov processes. For the estimation we suggest a Rao-Blackwellized particle smoother that combines the Kalman smoother and an efficient sequential Monte Carlo smoother. Sequential Monte Carlo smoothers can be applied to nonlinear, non-Gaussian state space models and are based on the idea to approximate the smoothing distribution of the latent states by weighted samples. For the estimation of the fluctuation pattern we develop a nonparametric estimation procedure.

A comparative study of an arbitrage–free interest rate model and a projected dynamic Nelson Siegel model

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[b]European Investment Bank, Luxembourg.

ABSTRACT

Many banks and central banks use parametric families of curves, such as the Nelson Siegel (NS) or Svensson families, to estimate the term structure of interest rates on a static basis. It is natural therefore to consider dynamic versions of these curves to describe the evolution of the term structure of interest rates through time. Various dynamic Nelson Siegel (DNS) models have been proposed: the family of NS curves can be viewed as a state space model and estimation of the unobserved state variables can be carried out using the Kalman Filter, see [4] for example. Despite the popularity of DNS models they have a fundamental disadvantage: the evolution of the term structure is not consistent with the absence of arbitrage. However, in [3] an econometric analysis of a DNS model was carried out and it was found to be close to an arbitrage–free model in a statistical sense. We compare the CDR model proposed in [2] (which is an arbitrage–free dynamic extension of the NS model that lies outside the NS family) with a non–arbitrage free DNS model. In fact, we propose a novel DNS model which we call the projected DNS. This is obtained by orthogonally projecting the dynamics of the CDR model onto the NS curve; so, at each point in time the projected model will generate the closest curve to the CDR forward curve which still lies in the NS family. This method is related to the projection filtering approach for nonlinear filtering [1]. Our analysis complements the statistical results found in [3]. Our methods can quantify the distance between the models in various different ways; to be precise we compute the difference between the models at particular calendar and maturity times, the difference between entire forward curves at particular calendar times and the difference between option prices generated by the CDR model and the approximated prices generated by the projected model.

REFERENCES

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[3] L. Coroneo, K. Nyholm, and R. Vidova-Koleva. How arbitrage–free is the Nelson–Siegel model? *European Central Bank working paper*, (874), 2008.

[4] F. X. Diebold and C. Li. Forecasting the term structure of government bond yields. *J. Econometrics*, 130(2):337–364, 2006.

Fitting dynamic factor models to non-stationary time series

Michael Eichler, Giovanni Motta, Rainer von Sachs

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ABSTRACT

Factor modelling of a large time series panel has widely proven useful to reduce its cross-sectional dimensionality. This is done by explaining common co-movements in the panel through the existence of a small number of common components, up to some idiosyncratic behaviour of each individual series. To capture serial correlation in the common components, a dynamic structure is used as in traditional (uni- or multivariate) time series analysis of second order structure, i.e. allowing for infinite-length filtering of the factors via dynamic loadings. In this paper, motivated from economic data observed over long time periods which show smooth transitions over time in their covariance structure, we allow the dynamic structure of the factor model to be non-stationary over time, by proposing a deterministic time variation of its loadings. In this respect we generalise existing recent work on static factor models with time-varying loadings as well as the classical, i.e. stationary, dynamic approximate factor model. Motivated from the stationary case, we estimate the common components of our dynamic factor model by the eigenvectors of a consistent estimator of the now time-varying spectral density matrix of the underlying data-generating process. This can be seen as time-varying principal components approach in the frequency domain. We derive consistency of this estimator in a "double-asymptotic" framework of both cross-section and time dimension tending to infinity. A simulation study illustrates the performance of our estimators.

A representation of vector autoregressive processes with common cycles

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ABSTRACT

We give necessary and sufficient conditions on the autoregressive polynomial for the existence of (possibly polynomial-) serial correlation common features as well as for other forms of common structures. We characterize the resulting moving average representations. These conditions allow to define the restrictions on the VAR parameters that correspond to various form of common dynamics. Results are stated for stationary VAR processes and we indicate how they directly extend to cointegrated VAR systems integrated of order 1 and 2.

Habit, Long Run Risk, Prospect?

Eric Aldrich[a], *A. Ronald Gallant*[a] *and Robert E. McCulloch*[b]

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[b]University of Texas

ABSTRACT

We use new Bayesian statistical methods to determine whether the data support the habit persistence asset pricing model of Campbell and Cochrane, the long run risk model of Bansall and Yaron, or the prospect theory model of Barberis, Huang, and Santos. These models differ primarily in their utility functions. The data these models confront are: annual stock returns, joint annual stock returns and consumption growth, and a panel consisting of Fama-French portfolio returns and returns on Treasury debt of various maturities.

Recursive estimation GARCH processes

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ABSTRACT

A recursive quasi-maximum likelihood method for estimating the parameters of a GARCH process is presented. Convergence results in an almost sure sense and in L_p are presented, along with extensive simulation results. The basis of the convergence analysis is the theory developed by Benveniste, Metivier and Priouret (BMP) for stochastic processes via a Markovian framework. A key device in ensuring convergence is a practically acceptable resetting mechanism, the effect of which has been successfully analyzed recently. The verification of the condition of the BMP theory requires the solution of some beautiful, nontrivial stability problems on the products of random matrices.

Identifiability, informativity, information matrix and the prediction error criterion: a new look at the connections

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ABSTRACT

We establish a number of equivalences that exist between four ingredients of a Prediction Error Criterion: the identifiability of the model structure, the informativity of the data, the rank of the information matrix, and the global minimum or minima of the Prediction Error Criterion. In establishing these equivalences, we show that the traditional definition of informativity of the data set is unnecessarily strong, and we introduce the new concept of informativity at a specific parameter value. Our results cover both open loop and closed loop identification.

An alternative framework for univariate and multivariate seasonal adjustment

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Keywords: seasonal adjustment, demodulation, seasonal unit root, seasonal cointegration, integrated processes, phase spectrum.

ABSTRACT

We propose a general framework that relies on a weak linear descriptive approach of integrated processes to describe the sources of persistent seasonal patterns in data. It only assumes that the polynomial associated to the Wold representation of the process appropriately differenced satisfies a summability condition that rules out some fractionally integrated processes. It relies on the algebraic property that any process integrated at various frequencies can be described as a sum of processes integrated at each frequency with the same innovation process. The basic idea of the statistical treatment consists then of removing from the raw data the pure seasonal random walk components present in these integrated processes at each seasonal frequencies. These random walk components are derived from a Beveridge-Nelson type decomposition of the demodulated process at each seasonal frequency. This framework allows for a simultaneous seasonal adjustment of a set of variables and the use of robust estimation procedures which limits the influence of outlier definition on the estimates of the seasonal adjusted data. This approach can also provide a rationale for the computation of asymmetric filters at the ends of the sample as the implicit filter used in this approach is unidirectional. Drawing on Solo(1992), we introduce a framework to compute the phase shift induced when applying such filters on integrated processes.

Feasible methods for testing for regime switching

Hajo Holzmann

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ABSTRACT

Switching regime models such as hidden Markov models, switching autoregressive models and switching garch models are popular and widely used models in econometrics. A basic problem for such models is to test for the presence of an underlying regime and possibly also for its number of states. It turns out that the asymptotic distribution of the likelihood ratio test for such problems is highly complicated as it involves the supremum of a truncated Gaussian process with covariance structure depending on unknown parameters. We shall discuss likelihood-based tests for these problems with tractable asymptotic distributions as well as reasonably good power properties.

Why Probability?

Rudolf Kalman

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ABSTRACT

While randomness, indeterminism, uncertainty ... are a common phenomenon in the real world, it is by no means obvious that they should be (or even can be) modeled by probability. We shall present some (unpublished) results concerning this problematique and also look at other related activities such as “fuzzy logic” and “soft computing”.

Dynamic sparse factor model

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Keywords: Dynamic factor model, identification, sparsity.
JEL classification: C11,C32

ABSTRACT

The analysis of large panel data sets (with N variables) involves methods of dimension reduction and optimal information extraction. Dimension reduction is usually achieved by extracting the common variation in the data into few factors (k, where $k \ll N$), which can be estimated by principal or frequency components. Other approaches like Bayesian panel vectorautoregression methods concentrate data variation in parsimonious model parametrization.
In the present paper, factors are estimated within a state space framework. To achieve a parsimonious parametrization, the $N \times k$ factor loading matrix is estimated under a sparse prior, which assumes that either many zeros may be present in each column of the matrix, or many rows may contain zeros. The significant factor loadings in columns define the variables driving the factors. Zeros in rows indicate irrelevant variables which do not add much information to the inference.
The contribution also includes a new way of identification which is borrowed from recent developments in the Bayesian cointegration literature.

Model selection in time series using penalty function criteria

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ABSTRACT

A large number of model selection criteria have been analysed in the time series context. These criteria range from the familiar AIC introduced by Akaike three decades ago, the MDL (minimum description length) principle of Rissanen, and extend to an enormous number of variations on these themes. In general these criteria contain a term describing 'lack of fit' that decreases with increasing model complexity, and a 'penalty' term that increases with complexity. For convenience we refer to them as 'penalty function criteria'. If it is assumed that data is generated by a finitely parametrized model that lies within the class of candidate models, a useful analysis may assess the model selection procedure in terms of consistency. In a more realistic situation where the candidate models are selected to approximate some aspect of a far more complex data generating process, the meaning of 'consistency' needs to be examined more carefully.

Here we discuss the behaviour of penalty function criteria when the data gener- ating process is outside the class of candidate models. Our particular examples include estimation of order in long memory autoregression models and the esti- mation of the number and locations of mean shifts in time series. Most theory for ARMA or AR models assumes that the time series has at least a fourth moment. We establish our results under weaker conditions on the data generating process and extend our analysis as far as possible for time series with moment $\alpha > 2$.

Cointegration Testing With Infinite Variance Noise

Keith Knight and Mahinda Samarakoon

University of Toronto

ABSTRACT

A number of authors (e.g. Caner, 1998; Paulauskas and Rachev, 1998) have consider the asymptotic properties of classical estimation and testing procedures for cointegrated processes driven by infinite variance noise. However, these classical procedures, which are typically based on least squares estimation, do not fully exploit the interesting dynamics of infinite variance processes and hence are inefficient. In this paper, we consider M-estimation for cointegrated processes in a vector autoregressive model driven by noise in the domain of attraction of an operator stable distribution (which may be a multivariate stable distribution but more generally allows different tail indices for each dimension), and develop the asymptotic theory for these estimators. These asymptotic distributions are related to a Wishart distribution whose parameters do not depend on the tail index parameters.

Testing for seasonal unit roots in monthly panels using parametric and nonparametric tests, with an application to tourism data

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[a]Erasmus University Rotterdam
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University of Vienna

ABSTRACT

We consider the problem of testing for seasonal unit roots in monthly panel data. To this aim, we generalize the quarterly CHEGY test to the monthly case. This parametric test is contrasted with a new nonparametric test, which is the panel counterpart to the univariate RURS test that relies on counting extrema in time series. All methods are applied to an empirical data set on tourism in Austrian provinces. The power properties of the tests are evaluated in simulation experiments that are tuned to the tourism data.

Fractional cointegration rank estimation

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Keywords: Error correction model, Gaussian VAR model, Maximum likelihood estimation, Likelihood ratio tests, Fractional cointegration rank
JEL: C12, C15, C32.

ABSTRACT

We consider the problem of cointegration rank estimation in the framework of fractional Vector Error Correction Mechanism (FVECM). We describe and compare different methods available up to date, namely four LR tests based on different assumptions on the model; a modification of Johansen and Nielsen's (2008) test using the sup norm in the spirit of Lasak's (2008) cointegration test; and a new two-step procedure. The modification of Johansen and Nielsen's (2008) test we propose generalizes the original method by allowing for a different cointegration degree under the alternative. This is also the aim of the new two-step procedure, whose first step consists in estimation of the FVECM under the null hypothesis of cointegration rank $r = r_0$: This provides consistent estimates of the cointegration degree d, cointegration vectors β and speed of the adjustment to the equilibrium parameters α and also (super) consistent estimates of $\beta_\perp$, orthogonal to β, such that $\beta_\perp' X_t$ is not cointegrated in any direction. In the second step, taking $\hat{\beta}_\perp$ as given, we propose to implement the sup tests considered in Lasak (2008), that are based on the $p - r_0$ vector series $\hat{\beta}_\perp X_t$, in this case reestimating d again. We analyse the performance of the proposed new procedures in finite samples and compare them with all the LR tests we discuss. These include cases when the cointegration degree is unknown and estimated under the null or under the alternative, Johansen and Nielsen's (2008) test and LR tests based on the standard VECM that assumes that the degree of cointegration is known and equal to one, like in Johansen (1988, 1991, 1995).

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Autoregressive Models with a Countable Infinity of Variables

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ABSTRACT

The general form of infinite-dimensional dynamic factor models is

$$x_{it} = a_i(L)\mathbf{u}_t + \xi_{it}, \quad i \in \mathbb{N} \tag{1}$$

where $\mathbf{u}_t$ is a q-dimensional white noise, the common shocks, $a_i(L)$ are square-summable filters, the idiosyncratic components ξ_{it} are weakly correlated across units i. However, in general the moving average (1) derives from a deeper set of autoregressive equations, for example,

$$x_{it} = \sum_{j=1}^{\infty} c_{ij}x_{jt-i} + d_i(L)\mathbf{v}_t + \eta_{it}, \quad i \in \mathbb{N} \tag{2}$$

where each variable x_{it} possibly depends on all variables x_{jt}, $j \in \mathbb{N}$, lagged by one period. This is typically the case in input-output systems, or when agent i determines the variable x_{it} using an aggregate (macro or sectoral) of some of the x's. In the present paper I establish conditions on the infinite dimensional matrix $(d_{ij})_{i,j\in\mathbb{N}}$ and the components η_{it}, such that (2) has a stationary solution of the form (1), i.e. a moving average in the common shocks, plus weakly correlated idiosyncratic components. I also show that some of the common shocks in (1) may result from inversion of (2), thus $\mathbf{v}_t$ does not necessarily coincide with $\mathbf{u}_t$. Generalization to higher order autoregressive equations and interesting examples are studied.

Parameter estimation in nonlinear AR–GARCH models

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ABSTRACT

This paper develops an asymptotic estimation theory for nonlinear autoregressive models with conditionally heteroskedastic errors. We consider a functional coefficient autoregression of order p (AR(p)) with the conditional variance specified as a general nonlinear first order generalized autoregressive conditional heteroskedasticity (GARCH(1,1)) model. Strong consistency and asymptotic normality of the global Gaussian quasi maximum likelihood (QML) estimator are established under conditions comparable to those recently used in the corresponding linear case. To the best of our knowledge, this paper provides the first results on consistency and asymptotic normality of the QML estimator in nonlinear autoregressive models with GARCH errors.

Panel VAR Models with Spatial Dependence

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Keywords: spatial panel vector-autoregression, spatial PVAR, multivariate, dynamic panel data model, spatial GM, spatial Cochrane-Orcutt transformation, constrained maximum likelihood estimation
JEL Codes: C13, C31, C33

ABSTRACT

I consider a panel vector autoregressive (panel VAR) model with cross-sectional dependence of the model disturbances that can be characterized by a first order spatial autoregressive process. I describe and discuss several alternative estimation strategies. First, I consider a computationally simple three-step procedure. Its first step consists of applying an instrumental variable estimation that ignores the spatial correlation of the disturbances. In the second step, the estimated disturbances are used to infer the degree of spatial correlation. The method suggested in this paper is a multivariate extension of the spatial generalized moments estimation. The final step of the procedure uses transformed data and applies standard techniques for estimation of panel vector-autoregressive models. When a qausi-maximum likelihood procedure is used, the procedure essentially becomes a constrained likelihood estimation. When the last step uses moment estimation, the procedure is then a multivariate spatial generalized method of moments estimation. Finally, as an alternative, I describe a full (quasi) maximum likelihood estimation method. I conclude by comparing the small-sample performance of the various estimation strategies in a Monte Carlo study.

State Space Modelling of Dynamic Factor Structures, with an application to the U.S. term structure

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Keywords: dynamic factor structure, state-space models, Kalman filter, entropy, prediction, U.S. yield curve
JEL-code: C32, C52, C82, E43

ABSTRACT

This paper applies the formal test of Jacobs and Otter (2008) [Determining the number of factors and lag order in dynamic factor models: A minimum entropy approach, Econometric Reviews, 27, 385–397] for the number of factors and lag order in a dynamic factor model, which is based on canonical correlations and related to entropy and Kullback- Leibler numbers. The testing procedure is used to cast the dynamic factor model in state-space form. We apply the proposed framework to U.S. yield curve data, with special emphasis on prediction and pre- diction errors.

Hellinger distance for multivariate spectrum estimation

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ABSTRACT

Due to the work of the Byrnes-Georgiou-Lindquist (BGL) school in recent years, generalized moment problems are gaining popularity as tools to derive spectra of processes given second-order statistics estimates. Consider the following inverse problem: Given a discrete-time stationary process $y(t)$, we feed it to a bank of filters represented by the input-to-state transfer function $G(z) = (zI - A)^{-1}B$. Suppose that we have estimated the asymptotic state covariance Σ of this system. We seek a spectral density consistent with Σ. As Georgiou pointed out, the structure of Σ poses notable limitations on the existence of such spectra. Nevertheless, when solutions exist, they are usually infinitely many (thus, in general, this problem is not well posed). In the BGL approach, this redundancy is dealt with resorting to convex optimization. A feasible spectrum is sought that minimizes some (pseudo-) distance from an "a priori spectrum" (the identity in the case of no prior information). This procedure has the great advantage that it allows to get rational solutions whose McMillan degree is a priori bounded in terms of the McMillan degrees of $G(z)$ and of the prior spectrum. In this spirit, after reviewing the conditions for existence of solutions, we show how constrained minimization a la Lagrange allows to find the spectrum which best approximates a particular "a priori" spectrum. We discuss both minimization in the Kullback-Leibler divergence and in the Hellinger distance. We then introduce a multivariable extension of the Hellinger distance. This is apparently the only metric in which the general multivariate approximation problem is so far known to admit an explicit solution. In all of these cases, existence for the finite-dimensional dual optimization problem can be established. This result, however, is highly nontrivial since the optimization takes place on an unbounded, open set. The numerical solution of the dual problem is carried trough a suitable matricial, Newton-like method. We finally outline an application to multivariate spectral estimation that appears to outperform standard multivariable identification techniques such as MATLAB's PEM and MATLAB's N4SID in the case of a short observation record.

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Analysis and Forecasting Hourly Prices in the European Electricity Market

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ABSTRACT

The dominating price indicator of the Central European electricity market is "Phelix" of the "European Energy Exchange" EEX, which inter alia provides a spot market for electricity in hourly time steps fixed in daily auctions. The optimization of the production (i.e. the scheduling of power plants) needs good assumptions on the distribution of Phelix within the next few days. As the market itself predicts only the prices for average("base" and "peak") values of the next weeks, we have to come to an own opinion about this stochastic process. Another task is to find out which variables determine or influence Phelix. These "fundamental" influences represent demand and supply of the market: load predictions, weather conditions, availability of power plants including water inflows and predicted wind production, strategic bids etc. These basic variables produce a quasi-periodic daily, weekly and yearly pattern with a high volatility. In this paper, we try to compare the results of different forecasting models and methods – econometric and time series models (OLS, GLS, ARIMAX models), "MARS" (multivariate adaptive regression splines), and also with external forecasts available on the service market. We highlight practical aspects as the ability of the models to explain "price spikes" and to learn from the very last history.

Forecasting Random Walks under Drift Instability

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Keywords: Forecast combinations, averaging over estimation windows, exponentially down-weighting observations, structural breaks
JEL classifications: C22, C53

ABSTRACT

This paper considers forecast averaging when the same model is used but estimation is carried out over different estimation windows. It develops theoretical results for random walks when their drift and/or volatility are subject to one or more structural breaks. It is shown that compared to using forecasts based on a single estimation window, averaging over estimation windows leads to a lower bias and to a lower root mean square forecast error for all but the smallest of breaks. Similar results are also obtained when observations are exponentially down-weighted, although in this case the performance of forecasts based on exponential down-weighting critically depends on the choice of the weighting coefficient. The forecasting techniques are applied to 20 weekly series of stock market futures and it is found that average forecasting methods in general perform better than using forecasts based on a single estimation window.

Admissibility Properties of Estimators Based on Order Estimation Procedures

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ABSTRACT

Many nonparametric models can be described by assuming that the parameters are infinite sequences of real numbers, which converge to zero. Typical examples models involving autoregressive processes with an infinite order, ir nonparametric estimators for regression functions based on series decompositions. A popular class of estimators is based on a penalized likelihood. For each number n, we construct an estimator the following way. We maximize the likelihood function under the restriction that all but the first n elements of our series are zero. The log-likelihoodfunction evaluated at the maximum will be an increasing function in n. So if we add a penalty term increasing in n to this maximum, we can find an "optimal" n and estimate the parameter by the corresponding ML estimator. Depending on the penalty term, we get various estimators, which are widely used in practise. Among the most common ones are the well-known AIC and BIC criteria. Here we prove an optimality result for BIC-type criteria. We show that the resulting estimator is asymptotically a Bayes estimator when we use reasonable prior distributions on the coefficients of our parameter. We allow for all coefficients to be nonzero. We only assume that the coefficients converge to zero sufficiently fast. We show that, for a relatively large class of quadratic distance functions, it is impossible to find another estimator which dominates the estimator based on penalized likelihood.
We concentrate on theorems which put no restrictions on the class of "competing" estimators. Our approach is not so much to show that an optimal "order" n is estimated. Instead we concentrate on the limiting distribution of the distance between estimated and true parameter. We show that certain fuctionals of the parameter can also estimated optimally by a "plug-in" estimator. As an application, we discuss optimal estimation of the "long-term variance" in $AR(\infty)$ processes. We also give examples that show that there is no straightforward generalization of our results: Under quite plausible prior distributions on the coefficients, the resulting Bayes estimator will have another structure.

Autoregressive Space-time (ARST) Models for Spatial Forecasting

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Keywords: Space-time models, ARST(p,q) processes, vector Space-time models, long-term system forecasting.

ABSTRACT

This paper discusses ARST(p,q) models for long-term forecasting for the use in spatial econometrics. Many economic panel models use data sets that are characterized by large cross sections and a short time section. To forecast such models we need dynamic models that are stationary. We show that modeling growth rates or levels by the popular SAR (spatial autoregressive) and Durbin models together with time lags we obtain simple ARST(p,q) or DARST(p,q) (i.e. Durbin ARST) models. We derive the stationarity conditions and show how stationary estimation and prediction can be implemented in a MCMC approach. We also extend these models to systems of ARST(p,q) models (VARST or vector ARST models) and derive the stability conditions. We demonstrate the approach by a example where we have to predict 20 years ahead of regional growth in 99 Austrian regions in a space-time dependent system of equations.

Hyper-spherical and Elliptical Stochastic Cycles

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Keywords: Multiple time series; Predator-pray models; State space models; Givens rotations.

ABSTRACT

A univariate first order stochastic cycle can be represented as an element of a bivariate first order vector autoregressive process, or VAR(1), where the transition matrix is associated with a Givens rotation. From the geometrical viewpoint, the kernel of the cyclical dynamics is described by a clockwise rotation along a circle in the plane. The reduced form of the cycle is either ARMA$(2,1)$, with complex roots, or AR(1), when the rotation angle equals 0 or π. This paper generalizes this representation in two directions. According to the first the cyclical dynamics originate from the motion of a point along an ellipses. The reduced form is also ARMA$(2,1)$, but the model can account for certain types of asymmetries. The second deals with the multivariate case; the transition matrix is obtained by a sequence of n- dimensional Givens rotations, and the reduced form is shown to be ARMA$(n,n-1)$. The properties of the resulting models are analyzed in the frequency domain, and we show that this generalization can account for a multimodal spectral density.
The illustrations show that the proposed generalizations can be fitted successfully to some well-known case studies. For instance, the elliptical model provides a parsimonious but effective representation of the Canadian lynx cycle and the mink-muskrat interaction. The hyperspherical model is used to analyse the interactions among gross domestic product growth rates of a set of European countries.

Limit Theory for Panel Data Models with Cross Sectional Dependence and Sequential Exogeneity

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ABSTRACT

The paper derives a general result for the limiting distribution of moment conditions related to panel data models with large n. The result allows for regressors to be only sequentially rather than strictly exogenous, while at the same time allowing the data to be cross sectionally dependent. The setup is sufficiently general to accommodate situations where cross sectional dependence stems from the presence of common factors, which lead to the need for random norming. The limit theorem is derived by showing that the moment conditions can be recast such that a martingale difference array central limit theorem by Hall and Heyde (1980) is applicable. We apply the result to establish a generalized estimation theory for GMM estimators of a fixed effect panel models without imposing an i.i.d. or strict exogeneity condition.

Co-integration and Interest Rates – The State-Space Error-Correction Model

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Keywords: Co-integration, state-space models, data-driven local coordinates, maximum likelihood estimation, reduced rank regression.

ABSTRACT

In this paper we consider co-integrated I(1) processes in the state-space framework. We introduce the state-space error correction model (SSECM) and provide a complete treatment of how to estimate SSECMs by maximum likelihood methods, including reduced rank regression techniques. In doing so, we follow very closely the Johansen approach for the VAR case; see Johansen (1995). The remaining free parameters will be represented using a novel type of local parametrization.
An application to UK money market zero rates shows the usefulness of the new approach.

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Nonparametric Trending Regression with Cross-Sectional Dependence

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ABSTRACT

Panel data, whose series length T is large but whose cross-section size N need not be, are assumed to have a common time trend. The time trend is of unknown form, the model includes additive, unknown, individual-specific components, and we allow for spatial or other cross-sectional dependence and/or heteroscedasticity. A simple smoothed nonparametric trend estimate is shown to be dominated by an estimate which exploits the availability of cross-sectional data. Asymptotically optimal choices of bandwidth are justified for both estimates. Feasible optimal bandwidths, and feasible optimal trend estimates, are asymptotically justified. A number of potential extensions are discussed.

On the Distribution of the Adaptive LASSO Estimator

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ABSTRACT

Penalized least squares or maximum likelihood estimators, such as the LASSO estimator, have been studied intensively in the last few years. While many properties of these estimators are now well understood, the understanding of their distributional characteristics, such as finite-sample and large-sample limit distributions, is still incomplete.
We study the distribution of the adaptive LASSO estimator (a variant of the LASSO introduced by Zou, 2006) for an orthogonal normal linear regression model in finite samples as well as in the large-sample limit. We show that these distributions are typically highly non-normal regardless of the choice of tuning of the estimator. The uniform convergence rate is obtained and shown to be slower than $n^{-1/2}$ in case the estimator is tuned to perform consistent model selection. Moreover, we derive confidence intervals based on the adaptive LASSO and also discuss the questionable statistical relevance of the 'oracle'-property of this estimator. Simulation results for the non-orthogonal case complement and confirm our theoretical findings for the orthogonal case. Finally, we provide an impossibility result regarding the estimation of the distribution function of the adaptive LASSO estimator.

Term Structure Estimation and Highly Persistent Processes in a Bayesian Context

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Keywords: Keywords: Market micro-structure noise, MCMC, near unit root behavior.
JEL: C01, C11, G12.

ABSTRACT

Term structure data usually exhibit a high degree of serial correlation. For these data, standard tests on a unit root often do not reject the null hypothesis of a unit root for usual significance levels. On the other hand side, from economic intuition and from the mathematical models used in the field of term structure modeling, stationary time series for term structure data should be observed (see e.g. Piazzesi (2005)[chapter 7.5]). In this article we stick to the Bayesian approach and investigate problems arising with serial correlation and different market micro-structure noise assumptions. The first innovative aspect is an adaptation of the priors to account for the problems arising with near unit root behavior. The second contribution to literature is an in depth investigation of parameter estimation for term structure models, where either all or only a subset of time series are observed with market micro-structure noise.

We start our analysis with an investigation of instantaneous yields. Although instantaneous yields cannot be observed with empirical data (maybe the overnight rate could be considered as a proxy), they are the main building block to derive non-instantaneous yields in affine term structure models (see e.g. Cochrane (2005), Piazzesi (2005), Lamberton and Lapeyre (2008)). For the instantaneous yields we already observe the core problem of highly persistent yields, which is a singularity in the Fisher information matrix when we approach a unit root.

To keep things simple and analytically traceable, we start the Vasicek (1977) framework. For this setting we analytically show that the Fisher information matrix is close to a singularity when the Ornstein- Uhlenbeck process driving the corresponding yields is highly persistent. In particular, the inverse of the element referring to the level of the stochastic process is going to explode. Therefore, the variance of this estimator is going to infinity.

In this paper we stick to the Bayesian approach. When sampling the parameters by means of Markov- Chain Monte Carlo Methods (MCMC) and the process approaches a unit root process, the Gibbs sampler produces a "wall", such that the posterior need not be integrable, i.e. we need not arrive at a proper posterior distribution. In this article we follow the works of Schotman and van Dijk (1991), Kleibergen and van Dijk (1994), Kleibergen and van Dijk (1998), de Pooter et al. (2006), and de Pooter et al. (2008) to construct priors, regularizing the posterior distribution of the parameters.

In the fixed income sector we observe yields for different maturities, i.e. we observe a term structure. We focus on the so called risk-free term structure, where only interest rate risk - and no other sources of risk like credit and liquidity risk - is investigated. Since the risk-free term structure is also a basic building block for reduced form credit risk models, the following analysis is also important for more general classes of models. The second innovative aspect of this article is an in depth econometric analysis of the problem of whether all yields should be assumed to be observed with micro-structure noise or that a certain number of yields - equaling the number of latent processes driving the yields - are observed without any noise.

Here, the noise term is often motivated by market micro-structure noise arising from bid-ask bounces, discreteness of the pricing scale, trades on different markets, etc. (see Campbell et al. (1996) and Aït-Sahalia (2007)). The scale of market micro-structure noise for liquid fixed income data usually estimated or assumed in literature is between two and five basis points, i.e. approximately one percent of the variation in the yields is subject to this component (for more details on this topic the reader is referred to Chen et al. (2007)). Here we demonstrate by means of simulation studies that with micro-structure noise being of such a size, the assumption that some yields are observed without error provides us with good parameter estimates, is much more efficient from the computation point of view and is also robust with respect to miss-specification of the micro-structure noise assumptions.
Although for the Vasicek model is well known to be insufficient to match the usual characteristics of the term structure data (e.g. level, slope and volatility; for more adequate models see e.g. Dai and Singleton (2000), Collin-Dufresne and Goldstein (2002) or Piazzesi (2005)), this model has been used to demonstrate and to investigate the problems of high serial correlation and different market micro- structure noise assumptions. In addition, we also demonstrate that the problems arising with near unit root behavior are also present in more general settings. Here we use a three factor model; more precisely we apply a model from the A1 (3) class (see Dai and Singleton (2000), Collin-Dufresne and Goldstein (2002)). Currently, A1 (3) settings are frequently used in finance. We obverse that the irregular behavior observed with the much simpler Vasicek framework does not disappear with this more general model. Last but not least, we provide parameter estimates for an A1 (3) model based on empirical data.

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A frequency domain approach to stochastic coefficient regression models

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ABSTRACT

In several applications, it is not always realistic to assume that that parameters in a multiple linear regression model are fixed over time. In some situations a more appropriate model may be a stochastic coefficient regression (SRC) model where the parameters change dynamically. This type of model has been considered widely in applied econometrics. In this talk we revisit the SCR model, as it encompasses a wide class of statistical models including locally stationary processes and approximates well time-varying coefficient models. We present a two-stage frequency domain approach to estimate the parameters in an SCR model. We obtain the sampling properties of the estimator under various conditions on the regressors. We present a simulation study and fit the model to real data. In particular, we fit the model to tbill and inflation data and emissions and visibility data.

Time Series Models With Asymmetric Laplace Innovations

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ABSTRACT

We propose autoregressive moving average (ARMA) and generalized autoregressive conditional heteroscedastic (GARCH) models driven by Asymmetric Laplace (AL) noise. The AL distribution plays, in the geometric-stable class, the analogous role played by the normal in the alpha-stable class, and has shown promise in the modeling of certain types of financial and engineering data. In the case of an ARMA model we derive the marginal distribution of the process, as well as its bivariate distribution when separated by a finite number of lags. The calculation of exact confidence bands for minimum mean-squared error linear predictors is shown to be straightforward. Conditional maximum likelihood-based inference is advocated, and corresponding asymptotic results are discussed. The models are particularly suited for processes that are skewed, peaked, and leptokurtic, but which appear to have some higher order moments. A case study of a fund of real estate returns, reveals that AL noise models may also provide a superior fit with substantially less parameters than their normal noise counterparts.

Empirical linear models for multivariate continuous time processes

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ABSTRACT

We describe a class of models that have proved useful and straightforward to apply to the construction of empirical linear models for continuous time series. They are appropriate for both high frequency regularly sampled series, and for irregularly sampled series. The models are based on the application of powers of the operator $(\kappa - s)/(\kappa + s)$ to past series values, to construct predictors for the future. The parameter κ is a time scale factor which can be chosen along with the maximum order of the operator, to optimize performance of the predictor according to an information criterion. The potential and limitations of the model will be considered, and examples given of its application to multiple time series arising in contexts that include econometrics, engineering, geophysics and astronomy.

Heteroskedasticity, Autocorrelation, and Spatial Correlation Robust Inference in Linear Panel Models with Fixed-Effects

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Keywords: panel data, HAC estimator, kernel, bandwidth, fixed-b asymptotics

ABSTRACT

This paper develops an asymptotic theory for test statistics in linear panel models that are robust to heteroskedasticity, autocorrelation and/or spatial correlation. Two classes of standard errors are analyzed. Both are based on nonparametric heteroskedasticity autocorrelation (HAC) covariance matrix estimators. The first class is based on averages of HAC estimates across individuals in the cross-section, i.e. "averages of HACs". This class includes the well known cluster standard errors analyzed by Arellano (1987) as a special case. The second class is based on the HAC of cross-section averages and was proposed by Driscoll and Kraay (1998). The "HAC of averages" standard errors are robust to heteroskedasticity, serial correlation and spatial correlation but stationarity in the time dimension is required. The "averages of HACs" standard errors are robust to heteroskedasticity and serial correlation including the nonstationary case but they are not valid in the presence of spatial correlation. The main contribution of the paper is to develop a fixed-b asymptotic theory for statistics based on both classes of standard errors in models with individual and possibly time fixed-effects dummy variables. The asymptotics is carried out for large time sample sizes for both fixed and large cross-section sample sizes. Extensive simulations show that the fixed-b approximation is usually much better than the traditional normal or chi-square approximation especially for the Driscoll-Kraay standard errors. The use of fixed-b critical values will lead to more reliable inference in practice especially for tests of joint hypotheses.

Identifiability and Estimation in Nonlinear Systems with Errors-in-Variables

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ABSTRACT

We consider a nonlinear errors-in-variables model where the distributions of the unobserved predictor variables and of the measurement errors are nonparametric. We use instrumental variable (IV) approach combined with Fourier decovolution to derive a rank condition for model identifiability. We also propose a second-order least squares (SLS) and a semiparametric estimator which are root-n conisistent under some regularity conditions. To overcome the possible numerical difficulties of minimizing an objective function envolving multiple integrals, we propose a simulation-based SLS estimator which is practical and computationally feasible. Unless other simulaiton-based estimators in the literature, this estimator is consistent and asmptotically normal with fixed simulation size.

The Real Time Monitoring Test for Long Run Behavior of Stock Returns

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Keywords: CUSUM of Squares Tests; Serial Correlation; Unit Root
JEL classification: C22

ABSTRACT

This paper considers the monitoring CUSUM of squares (CUSQ) test in a class of time series models via an autoregressive (AR) spectral estimators, namely MCUSQAR. We derive its limit distribution following the a Brownian Bridge and show it does not depends on the nature of the error process, when the data generating processes (DGPs) are unit root with deterministic components, stationary with uncorrelated errors, or dependent errors , the regression under general mixing assumptions on the regressor and the errors. Additionally, our monitoring test can be viewed as a test for a change from I(0) to I(1) and vice versa without assuming the known direction and location of the change point. We demonstrate through Monte Carlo studies that our monitoring CUSUM tests not only control size distortion very well, but also have promising power performance. Finally, we applied the MCUSQAR test to monitor the real time pattern of U.S stock index from 1802 to 2007.

Weighted-Covariance Factor Decomposition of VARMA Models Applied to Forecasting quarterly U.S. GDP at Monthly Intervals

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ABSTRACT

We develop and apply a method, called weighted-covariance factor decomposition (WCD), for reducing large estimated vector autoregressive moving-average (VARMA) data models of many "important" and "unimportant" variables to smaller VARMA-factor models of "important" variables and significant factors. WCD has four particularly notable features, compared to frequently used principal components decomposition, for developing parsimonious dynamic models: (1) WCD reduces larger VARMA-data models of "important" and "unimportant" variables to smaller VARMA-factor models of "important" variables, while still accounting for all significant covariances between "important" and "unimportant" variables; (2) WCD allows any mixture of stationary and nonstationary variables; (3) WCD produces factors, which can be used to estimate VARMA-factor models, but more directly reduces VARMA-data models to VARMA-factor models; and, (4) WCD leads to a model-based asymptotic statistical test for the number of significant factors. We illustrate WCD with U.S. monthly indicators (4 coincident, 10 leading) and quarterly real GDP. We estimate 4 monthly VARMA-data models of 5 and 11 variables, in log and percentage-growth form; we apply WCD to the 4 data models; we test each data model for the number of significant factors; we reduce each data model to a significant-factor model; and, we use the data and factor models to compute out-of-sample monthly GDP forecasts and evaluate their accuracy. The application's main conclusion is that WCD can reduce moderately large VARMA-data models of "important" GDP and up to 10 "unimportant" indicators to small univariate-ARMA-factor models of GDP which forecast GDP almost as accurately as the larger data models.

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