PROGRAMME AND ABSTRACTS

2nd International Workshop on Computational and Financial Econometrics

http://www.dcs.bbk.ac.uk/cfe08/

and

First Workshop of the ERCIM Working Group on Computing & Statistics

http://www.dcs.bbk.ac.uk/ercim08/

University of Neuchâtel, Switzerland
June 19-21, 2008

Address:

Universite de Neuchâtel
UniMail
Rue Emile-Argand 11
CH-2007 Neuchâtel
Switzerland

ERCIM
European Research Consortium for Informatics and Mathematics

CFE08 Co-Chairs

A. Amendola (IT), D.A. Belsley (USA), E.J. Kontoghiorghes (CY) and M. Paolella (CH)

CFE08 Programme committee:

G. Barone-Adesi (CH), L. Bauwens (BE), M. Binder (GE), S. Boyarchenko (NL), C. Chen (TW), J. Coakley (UK), C. Croux (BE), R. Davidson (CA), I. Demetriou (GR), K. Fokianos (CY), P. Foschi (IT), C. Francq (FR), A.-M. Fuertes (UK), G. Gallo (IT), M. Gilli (CH), Z. Hlavka (CZ), M. Juillard (FR), G. Kapetanios (UK), D. Kuhn (UK), L. Khalaf (CA), C. Kleiber (CH), O. Linton (UK), A. Luati (IT), T. Lux (GE), J. MacKinnon (CA), D. Maringer (UK), S. Mittnik (GE), I. Moustaki (GR), Y. Omori (JP), M. Ooms (NL), S. Paterlini (IT), D.S.G. Pollock (UK), Z. Psaradakis (UK), T. Proietti (IT), M. Riani (IT), E. Ruiz (ES), B. Rustem (UK), W. Semmler (GE), M. Schroeder (GE), O. Scaillet (CH), S. Siokos (UK), G. Storti (IT), H.K. Van Dijk (NL), M. Wagner (AT), J. Walde (AT), P. Winker (GE), A. Zeileis (AT), Z. Zhang (USA), M. Wolf (CH).

ERCIM08 Co-Chairs

A. Colubi (ES), C. Gatu (RO), E.J. Kontoghiorghes (CY), S. Van Aelst (BE) and P. Winker (GE).

ERCIM08 Programme committee:

A. Amendola (IT), M. Avalos (FR), M. Billio (IT), C. Borgelt (ES), P. Congdon (UK), R. Coppi (IT), C. de Peretti (FR), T. Denoeux (FR), P. Filzmoser (AT), R. Fried (GE), S. Fruhwirth-Schnatter (AT), L.A. Garcia-Escudero (ES), M.A. Gil (ES), M. Gilli (CH), J. Godolphin (UK), G. Gonzalez (ES), A. Gordaliza (ES), G. Govaert (FR), P. Groenen (NL), Y. Guedon (FR), C. Hennig (UK), M. Hubert (BE), D. Kurowicka (NL), R. Kruse (DE), M. La Rocca (IT), A. Matei (CH), S.G. Meintanis (GR), D. Morales (ES), J. Pacheco (ES), C. Perna (IT), D.S.G. Pollock (UK), J. Savoy (CH), A. Staszewska (PL), M. Timmerman (NL), N. Trendafilov (UK), K. Triantafyllopoulos (UK), R. Viertl (AT), I. Vrontos (GR), J.M. Zakoian (FR), A. Zeileis (AT).

Local organizing committee:

J. Argyrou, C. Barna, C. Bekas, G. Botalla, E. Constandinide, L. Dolamic, C. Fautsch, C. Gatu, M. Hofmann, P. Kropf, M. Lyra, A. Matei, J. Misserli, E. Tsinti and P. Yanev.

Dear Friends and Colleagues,

Welcome to the 2nd International Workshop on Computational and Financial Econometrics (CFE08) and the First meeting of the ERCIM Working Group on Computing & Statistics (ERCIM08). The conference Co-chairs are happy to host this international conference in Neuchâtel. The last two days of the meeting take place jointly at the same venue as the 5th International Workshop on Parallel Matrix Algorithms and Applications (PMAA'08).

The conference aims at bringing together researchers and practitioners to discuss recent developments in computational methods for economics, finance, and statistics in general. The CFE08-ERCIM08 programme consists of 65 regular sessions, 4 plenary talks and around 300 presentations. The PMAA08 add further 80 presentations. There are over 400 participants. Peer reviewed papers will be considered for publication in special issues of the journal Computational Statistics and Data Analysis.

The Co-chairs have endeavored to provide a balanced and stimulating programme that will appeal to the diverse interests of the participants. The local organizing committee hopes that the conference venue will provide the appropriate environment to enhance your contacts and to establish new ones.

The conference is a collective effort of many individuals and organizations. The Co-chairs, the scientific programme committee, the local organizing committee and volunteers have contributed substantially to the organization of the conference. We are acknowledging the support of our sponsors and particularly the host Department of Computer Science, University of Neuchâtel.

We hope that you enjoy the conference and your stay in Neuchâtel.

The conference Co-chairs:
A. Amendola, *D.A. Belsley*, *A. Colubi*, *C. Gatu*, *E.J. Kontoghiorghes* (Chair), *M. Paolella* *S. Van Aelst* and *P. Winker*.

The local organizers: *C. Bekas*, *C. Gatu*, *M. Hofmann*, *P. Kropf*, *A. Matei* and *P. Yanev*.

ERCIM Working Group on COMPUTING & STATISTICS

http://www.dcs.bbk.ac.uk/ercim/

AIMS AND SCOPE

The Working Group (WG) focuses on all computational aspects of statistics. Of particular interest is research in important statistical applications areas where both computing techniques and numerical methods have a major impact. The aim is twofold: first, to consolidate the research in computational statistics that is scattered throughout Europe; second to provide researchers with a network through which they can obtain an unrivalled source of information about the most recent developments in computational statistics and applications. Emphasis will be given to computational methods with computational statisticians being the primary target of the WG.

The scope of the WG is broad enough to include members in areas of computing which have a major impact on statistical techniques and methods of data analysis. All aspects of statistics which make use, directly or indirectly, of computing are considered. Applications of computational statistics in diverse disciplines will be strongly represented. These areas include economics, medicine and epidemiology, biology, finance, physics, chemistry, climatology and communication.

The range of topics addressed and the depth of coverage will position the WG to be the essential research network in the niche area of advanced computational and numerical methods in statistics.

The WG will comprise a number of tracks (subgroups, teams) in various research areas of computational statistics. The teams will act autonomously within the framework of the WG in order to promote their own research agenda. The activities of the teams -including research proposals- will be endorsed by the WG. It is expected that the teams will be organizing sessions and workshops during the annual WG meeting.

There will be a strong link between the ERCIM WG, the ERS-IASC and the Journal of Computational Statistics & Data Analysis.

Specialized Groups

Currently the ERCIM WG has approximately 300 members and the following specialized groups:

MCS: Matrix Computations and Statistics.

CFE: Computational Econometrics and Financial Time Series.

SSEF: Statistical Signal Extraction and Filtering.

RDM: Robust Analysis of Complex Data Sets.

OHEM: Optimization Heuristics in Estimation and Modelling.

FSA: Fuzzy Statistical Analysis.

AlgSoft: Statistical Algorithms and Software.

SFD: Statistics for Functional Data.

FGen: Functional Genomics.

SEM: Latent Variable and Structural Equation Models.

MM: Mixture Models

More specialized groups are currently under construction. You are encouraged to become a member of the WG. For further information please contact Erricos John Kontoghiorghes at: matrix@dcs.bbk.ac.uk , or the Chairs of the specialized groups. For further information:
http://www.dcs.bbk.ac.uk/ercim.

SCHEDULE

All lectures take place at the UniMail building (Rue Emile-Argand 11), University of Neuchâtel.

Thursday, 19th June 2008

08:50 - 09:00	Opening (Room: GGA)
09:00 - 09:55	Plenary Talk (Herman K. Van Dijk)
09:55 - 10:15	Coffee Break
10:15 - 12:15	Parallel Sessions B
12:15 - 14:00	Lunch Break
14:00 - 16:00	Parallel Sessions C
16:00 - 16:25	Coffee Break
16:25 - 17:20	Plenary Talk (Oliver Linton)
18:00 - 19:30	Reception

Friday, 20th June 2008

09:00 - 11:00	Parallel Sessions E
11:00 - 11:20	Coffee Break
11:20 - 12:15	Plenary Talk (Bernard Philippe)
12:15 - 14:00	Lunch Break
14:00 - 16:00	Parallel Sessions G
16:00 - 16:25	Coffee Break
16:25 - 18:30	Parallel Sessions H
20:00	Conference Dinner

Saturday, 21st June 2008

09:00 - 11:00	Parallel Sessions I
11:00 - 11:20	Coffee Break
11:20 - 13:20	Parallel Sessions J
13:20 - 15:00	Lunch Break
15:00 - 17:00	Parallel Sessions K
17:00 - 17:20	Coffee Break
17:20 - 18:15	Plenary Talk (Michael Berry)
19:30	Fondue Dinner

SPECIAL MEETINGS by invitation to group members

- COST meeting, Thursday 19th of June, Room GB1, 16:30 - 17:20.
- COST meeting, Friday 20th of June, Room GB1, 08:00 - 08:55.
- CSDA Editorial Board Lunch-Meeting , Friday 20th of June, 12:30 - 14:30.

SOCIAL EVENTS

- The coffee breaks will last one hour each (which adds fifteen minutes before and after to the times that are indicated in the programme). Weather permitting the coffee breaks will take place on the terrace by the cafeteria of UniMail, otherwise they will take place in the first and second floor of UniMail.

- Welcome Reception, Thursday 19th June, 18:00. The reception is open to all registrants. It will take place in the Neuchâtel Castle (Salle de Chavalieres, Château de Neuchâtel). You must have your conference badge in order to attend the reception.

- Lunches will be served at the *Restaurant Le Romarin* which is 10 minutes walk from the venue. Anyone not registered for the lunch can have meals at the UniMail cafeteria (except the weekend) and at the various restaurants of the shopping centre which is 15 minutes walk from the venue.

- Conference Dinner, Friday 20th June, 20:00. The Conference Dinner will take place at the gastronomic restaurant Hotel DuPeyrou, Avenue DuPeyrou 1, CH-2000 Neuchâtel. The restaurant is 10-15 minutes walk from UniMail and the town centre (Detailed information will be available at the conference registration desk). The conference dinner is optional and registration is required.

  You must have your Conference Dinner ticket and your conference badge in order to attend the conference dinner.

- Fondue Dinner, Saturday 21st June, 19:30. The Fondue Dinner will take place at two different places: at the *Brasserie Le Cardinal* (Rue de Seyon 9, Neuchâtel) which is at the centre of the town, and *La Taverne Neuchâteloise* (Rue de l'Orangerie 5, Neuchâtel) which is 10-15 minutes walk from the centre. The tickets indicate the name of the restaurant which you should attend. Please note that the restaurants are fully booked and you should attend the restaurant indicated in your ticket. The fondue dinner is optional and registration is required.

  You must have your Fondue Dinner ticket and your conference badge in order to attend the conference dinner.

GENERAL INFORMATION

Lecture Rooms

The paper presentations will take place at the UniMail, University of Neuchâtel. There are ten lecture rooms. Three of them (GGA, GPA and GB1) are in the Chemistry building, while the other seven are in the main building of UniMail. There will be signs indicating the location of the lecture rooms. Please ask for assistance and directions at the registration desk.

The plenary talks will take place in the lecture room GGA (Chemistry building), and will last 55 minutes including questions. Each session will be 2 hours long. Chairs are requested to keep the session on schedule. Papers should be presented in the order in which they are listed in the programme for the convenience of attendees who may wish to switch rooms mid-session to hear particular papers. In the case of a no-show, please use the extra time for a break or a discussion so that the remaining papers stay on schedule.

Presentation instructions

The lecture rooms will be equipped with a PC, a computer projector and in most cases an overhead projector. The session chairs should obtain copies of the talks in a USB stick before the session starts (use the lecture room as the meeting place), or obtain the talks by email prior to the conference beginning. Presenters must deliver the files with the presentation in PDF (Acrobat) or PPT (Powerpoint) format on a USB memory stick to the session chair ten minutes before each session.

The PC in the lecture rooms should be used for presentations. The session chairs should have a laptop for backup.

Swiss plugs/power outlets are different from those in the rest of Europe, including Germany. We cannot provide adapters, so please do not forget to take your adapters if needed.

Internet

There will be access to PCs connected to the Internet at the main entrance of the UniMail. The wireless Internet connection is also freely available at UniMail.

Messages

You may leave messages for each other on the bulletin board by the registration desks.

SUPPORTERS

ERCIM (European Research Consortium for Informatics and Mathematics)

Journal of Computational Statistics & Data Analysis

Elsevier

The Society for Computational Economics

International Association for Statistical Computing

COST Action IC0702 SoftStat

Department of Computer Science, University of Neuchâtel, Switzerland

FINRISK (Financial Valuation and Risk Management), Switzerland

Philips Moris International

Banque Cantonale Neuchâteloise.

PUBLICATIONS OUTLETS

Journal of Computational Statistics & Data Analysis

Papers containing strong computational statistical or econometric components or substantive data analytic elements will be considered for publication in a special peer-reviewed, or regular, issue of the journal of Computational Statistics & Data Analysis.

Selected peer-reviewed papers will be published in the 5th special issue on Computational Econometrics of the Computational Statistics & Data Analysis. Submissions for the 5th special issue should contain both a computational and an econometric or financial-econometric component. The guest editors of this special issue are: D.A. Belsley, P. Duchesne, G. Kapetanios, E.J. Kontoghiorghes, M. Paolella and H.K. Van Dijk.

There will be open call for papers to other CSDA special issues in the areas of *Matrix Computations and Statistics*, *Variable selection and robustness* and *Statistical Algorithms and Software*.

Papers will go through the usual review procedures and will be accepted or rejected based on the recommendations of the editors and referees. However, the review process will be streamlined in every way possible to facilitate the timely publication of the papers. As always, papers will be considered for publication under the assumption that they contain original unpublished work and that they are not being submitted for publication elsewhere.

Papers should be submitted electronically using the Elsevier electronic submissions tool:
`http://ees.elsevier.com/csda/`.
Please be sure that all submissions are DOUBLE SPACED. Single-spaced papers will be returned.

The deadline for paper submissions is the 15th September 2008.

Any questions may be directed via email to: csda@dcs.bbk.ac.uk

Contents

Thursday, 19.06.2008 09:00-09:55 Room: GGA Plenary talk 1

Possibly ill-behaved posteriors in econometric models

Speaker: **Herman K. Van Dijk, Erasmus University Rotterdam, The Netherlands** Chair: M. Paolella

It is shown that artificial neural networks may serve as perfect candidate/importance densities in Markov chain Monte Carlo and Importance Sampling methods for two reasons. First, artificial neural network functions possess a universal approximation property. Second, it is also easy to sample pseudo random draws from such networks. Given this existence property, several procedures are presented to search for such neural networks. First, it is shown that an analytical approach involving the construction of a perfect neural network exists. In this approach, use is made of a multi-layer perceptron with arctangent activation function. This neural network falls within the class for which approximation capabilities have been previously derived. For this type of neural network function - when considered as a density kernel (on a bounded domain) all moments can be evaluated by analytical integration. However, the construction of such an analytical approximation requires usually (too) much time. A (usually much) quicker alternative is given by a simulation approach that uses a mixture of Student t densities as a candidate density for the posterior density of the parameters of interest. The methods are applied to a IV model with reduced rank on education and income), a two-regime dynamic mixture process for US real GNP, and to a method for efficient evaluation of options. The results compare favorably with other simulators such as Gibbs sampling with data augmentation and the Metropolis-Hastings algorithm or IS with a normal or t candidate.

Thursday, 19.06.2008 16:25-17:20 Room: GGA Plenary talk 2

Iterative smoothing algorithms and their application in finance

Speaker: **Oliver Linton, London School of Economics and Political Science, UK** Chair: Berc Rustem

There is an important class of nonparametric/semiparametric models where the quantity of interest is a function $g(.)$ that is only implicitly defined but is known to satisfy a linear integral equation of the second kind in the function space $L_2(p)$ for some density p,

$$g(x) = g^*(x) + \int \mathcal{H}(x,y)g(y)p(y)dy, \tag{1}$$

where the function $g^*(x)$ and the operator $\mathcal{H}(x,y)$ are defined explicitly in terms of the distribution of some observable quantities. This sort of structure arises in many statistical problems and we shall give some examples. A key question is whether there exists a unique solution to (1) and whether that solution is continuous in some sense. Even if the answer to these questions is affirmative, the implicit definition of the function g leads to some challenging problems in computation and in statistical inference when noisy observations $\widehat{g}^*(x)$ and $\widehat{\mathcal{H}}(x,y)$ are available on $g^*(x)$ and $\mathcal{H}(x,y)$. A common approach that is applicable in many problems is to follow some iterative scheme to locate approximate solutions of (1). A rigorous treatment for the example of additive nonparametric regression has recently been provided. There are many extensions of this model that have applications in economics and finance and we review some examples. We review the issues surrounding the computation of the estimators. We also review some further practical issues regarding bandwidth choice and standard error construction.

Friday, 20.06.2008 11:20-12:15 Room: GGA Plenary talk 3

A parallel GMRES method preconditioned by a multiplicative Schwarz iteration

Speaker: **Bernard Philippe, INRIA Rennes, France** Chair: Y. Saad

Domain decomposition provides a class of methods suitable for the solutions of linear or nonlinear systems of equations arising from the discretization of partial differential equations. For linear problems, domain decomposition methods are often used as preconditioner for Krylov subspace iterations. Traditionally, there are two classes of iterative method which derive from domain decomposition with overlap: say Additive Schwarz and Multiplicative Schwarz. When using those two methods as solvers, the convergence rates are very slow and the convergence is just proved for symmetric positive definite matrices and M-matrix. For that reason, the particular interest of Schwarz methods is as preconditioner of Krylov subspace methods. The additive version is usually preferred because it is easily implemented on a parallel computer although it is usually a less efficient preconditioner than its multiplicative version. The challenge of this work was to derive a fully automatic parallel GMRES method preconditioned through a Multiplicative Schwarz iteration based on algebraic domain decomposition. For that purpose the following results have been obtained:

- Construction of an automatic 1D partitioner of a sparse matrix,
- Derivation of an explicit expression of the preconditioner,
- Parallel pipeline to build a basis of the Krylov subspace which is then orthogonalized,

- Control of the dimension of the basis trough an estimation of the involved roundoff errors,
- Design of a code in the PETSc format.

Numerical experiments illustrate the results.

Saturday, 21.06.2008 17:20-18:15 Room: GGA Plenary talk 4

Exploiting nonnegativity in matrix and tensor factorizations for improved text mining

Speaker: **Michael Berry, University of Tennessee, Knoxville, USA** Chair: A. Sameh

Automated approaches for the identification and clustering of semantic features or topics are highly desired for text mining applications. Using low rank nonnegative matrix factorizations (NNMFs) to retain natural data nonnegativity, one can eliminate subtractive basis vector and encoding calculations present in techniques such as principal component analysis for semantic feature abstraction. Moving beyond two-way factorizations, we demonstrate how nonnegative tensor factorizations (NNTFs) can be used to capture temporal and semantic proximity and thereby enable the tracking of both targeted and latent (previously unknown) discussions or communication patterns. Demonstrations of NNMF and NNTF algorithms for topic (or discussion) detection and tracking using the Enron Email Collection and documents from the Airline Safety Reporting System (ASRS) are provided. Recent with alternative (one and infinity) norm formulations of the objective functions associated with NNMF factorization will also be presented.

Thursday 19.06.2008 10:15-12:15 Parallel Session B

ES02 Room: GPA VARIABLE SELECTION AND ROBUSTNESS Chair: Stefan Van Aelst

#53: **On the efficient calculation of robust regression estimators**

Presenter: Salvador Flores@Universite Paul Sabatier, France

We address the problem of the efficient computation of robust estimators for statistical regression based on M-scales. The principal aim of our work is to investigate to what extent the most recent developments in optimization theory can help improving the existing computational methods. For the classical Gaussian regression model, robust estimators of regression can be obtained as solutions of a non convex minimization problem. Thus, we are faced with a global optimization problem, which is one of the hardest problems in optimization. In the first part of our work, we concentrate on the local minimization aspects of the problem, which are present in almost all modern global optimization schemes. In the second part of this work, we analyse the global optimization techniques, most of them stochastics, that are relevant to our applicative context. We show how many of the existing strategies for computing robust regression estimators fit into classical global minimization schemes. Then, we analyze the potential usage of Clustering Analysis Techniques to improve some recently proposed methods for computing these estimators.

#98: **Robustness for high-dimensional data analysis**

Presenter: Peter Buhlmann@ETH Zurich, Switzerland

Many applications nowadays involve high-dimensional data with p variables (or covariates), sample size n and the relation that $p \gg n$. The success of high-dimensional data analysis hinges on (i) some form of sparsity; (ii) coherence properties among covariates; and (iii) suitable *concentration properties* of (generalized) sample means. If (i) or (ii) do not hold, we probably have to change our goal in the analysis of high-dimensional data. Potential problems arising with issue (iii) can be addressed by simple (yet underdeveloped) robustifications of moment and correlation estimators. The talk includes a brief review of powerful non-robust methods for high-dimensional data and discusses some approaches and open problems about robustness in the $p \gg n$ setting.

#9: **Variable selection for time series forecasting using the groupwise LARS algorithm**

Presenter: Christophe Croux@K.U.Leuven, Belgium
Co-authors: Sarah Gelper

Least Angle Regression (LARS) is a variable selection method with proven performance for cross-sectional data. In this paper, it is extended to time series forecasting with many predictors. The new method builds parsimonious forecast models, taking the time series dynamics into account. It is a flexible method that allows for ranking the different predictors according to their predictive content. The time series LARS shows good forecast performance, as illustrated in a simulation study and two real data applications, where it is compared with the standard LARS algorithm and forecasting using diffusion indices.

#93: **Fast robust variable selection with missing data**

Presenter: Stefan Van Aelst@Ghent University, Belgium
Co-authors: Jafar Khan, Ruben Zamar

Computationally efficient algorithms are needed for robust variable selection for regression with many candidate predictors. Missing data can further complicate the problem. However, most available robust variable selection methods are very time consuming and can not handle missing values. We discuss some recently proposed computationally efficient procedures for robust variable selection. These algorithms are based on the standard forward or stepwise selection techniques or the recent powerful Least angle regression technique, but replace the classical, nonrobust pairwise correlations by robust counterparts. We explain how these algorithms can easily handle missing values by calculating robust pairwise correlations from all complete observations for the variables under consideration. This is a valid approach when that the data are missing completely at random which means that the probability of missingness does not depend on the data itself.

ES15 Room: B104 TIME SERIES ESTIMATION AND PREDICTION Chair: Anna Staszewska

#50: **A coordinate free conditional distribution in BEKK model: Bayesian analysis for WSE**

Presenter: Mateusz Pipien@Cracow University of Economics, Poland

For the conditional distribution in BEKK model some generalisation is proposed. Initially, our multivariate conditional distribution is constructed on the basis of a product of the univariate symmetric Student-t distributions. Thereafter, we impose skewness on the univariate components according to a generalised approach based on the inverse probability integral transformations. In particular, we apply the hidden truncation mechanism, some approaches based on the inverse scale factors in, order statistics concept, Beta distribution transformation, Bernstein density transformation and the constructive method. In the next step we applied orthogonal transformation of defined distribution in order to assure, that fat tails and also possible skewness can be imposed according to coordinates not necessarily equivalent to those stated initially by univariate components. Consequently our class of distributions can model skewness and is coordinate free. The main goal of the paper was to check the empirical importance of proposed generalisations within the BEKK process. We applied Bayesian model comparison, based on the posterior probabilities, to check

the explanatory power of competing Multivariate GARCH specifications, as well as to analyse empirical properties of some bivariate processes on the Warsaw Stock Exchange.

#74: **Aggregation of vector ARMA processes: some further results**

Presenter: Giacomo Sbrana@United Nations, USA

The contemporaneous aggregation of ARMA processes has received considerable attention in the econometric literature. More recently, due to the focus on modelling and forecasting aggregate variables in the Euro-area, many empirical papers have addressed the issue of choosing between aggregated ARMA versus national specific ARMA models. This paper attempts to shed further light on the characteristics of the aggregate ARMA processes. It is shown that the parameters of the macro process can be expressed as direct functions of the micro parameters provided that the micro processes can be expressed as a VMA(1) system. More specifically, summing up across N moving average processes of order one leads to a moving average process of order one whose parameters are exact functions of the micro parameters. Therefore, the forecasting properties of the aggregate process can be easily recovered from the structure of the VARMA generation process. Moreover, the forecasting performances of aggregate and disaggregate predictors are compared. Furthermore, Monte Carlo simulations show that the small sample properties for the aggregate process are particularly good.

#69: **Confidence bands for VAR forecast paths**

Presenter: Anna Staszewska@University of Lodz, Poland

The problem of forecasting from vector autoregressive models has attracted considerable attention in the literature. The most popular non-Bayesian approaches use large sample normal theory or the bootstrap to evaluate the uncertainty associated with the forecast. The literature has concentrated on the problem of assessing the uncertainty associated with the prediction for a single time period. The present paper considers the more important but much less studied problem of how to assess the uncertainty when the forecasts are done for a succession of periods. It describes and evaluates bootstrap methods for constructing confidence bands for forecast paths. Similar methods have already been employed in the construction of confidence bands for impulse response paths. The bands are constructed from forecast paths obtained in bootstrap replications with an optimisation procedure used to find the envelope of the most concentrated paths. The methods are evaluated by means of Monte Carlo experiments performed on a range of DGPs.

ES16 Room: GB1 STATISTICS WITH INCOMPLETE DATA Chair: Gil Gonzalez-Rodriguez

#83: **Pruning decision trees with fuzzy concepts**

Presenter: Matthias Steinbrecher@Otto-von-Guericke-University Magdeburg, Germany
Co-authors: Rudolf Kruse

Decision trees have become a widely spread method of analysing data in business organisations. One reason for this acceptance can be attributed to the intuitive comprehensibility of the results. Since the data-generating processes may change over time, one has to deal with a forest of decision trees that share one part of their structure and differ in another part. A critical task is to select those subtrees that are not only contained in some minimum portion of all trees but also identify all subtrees that exhibit a certain temporal behavior that the user is interested in. We present a method of specifying the behavior of the temporal changes of interest with means of fuzzy, i.e., linguistic concepts. The user is allowed to postprocess the accustomed decision trees with likewise intuitive and interpretable linguistic descriptions.

#84: **Aggregate loss models: a nonparametric approach**

Presenter: Ricardo Cao@Universidade da Coruna, Spain
Co-authors: Juan Vilar, Maria Concepcion Ausin

This paper describes a nonparametric approach to make inference for aggregate loss models in the insurance framework. We assume that an insurance company provides a historical sample of claims given by claim occurrence times and claim sizes. Furthermore, information may be incomplete as claims may be censored and/or truncated. In this context, the main goal of this work consists in fitting a probability model for the total amount that will be paid on all claims during a fixed future time period. In order to solve this prediction problem, we propose a new methodology based on nonparametric estimators for the density functions with censored and truncated data, the use of Monte Carlo simulation methods and bootstrap resampling. An alternative Bayesian approach, using a semiparametric model based on Coxian distributions, has been also proposed. The developed methods are useful to obtain the best strategy in different insurance decision problems. The proposed procedures are illustrated with a real data set provided by the insurance department of an international commercial company.

#85: **A possible extension of upper and lower probabilities to the case of fuzzy random variables**

Presenter: Wolfgang Trutschnig@Vienna University of Technology, Austria

In many situations a real-valued random variable X can not be observed precisely but it may be possible to observe a random interval I or a fuzzy random variable X* that contains the true random variable with probability one. The question arises, in which way the distribution of the random variable X can be approximated by means of the observable random interval or the observable fuzzy random variable. In case of a random interval one possible answer is given by Dempster's well-known lower and upper

probabilities. It will be shown that DempsterÂ´s concept can easily be extended to the case of fuzzy random variables, which yields so-called fuzzy-valued probabilities. The main properties of these generalized probabilities will be mentioned and it will be shown that as in the classical, real-valued case these probabilities can be regarded as limits of relative frequencies. Furthermore related open problems will be stated.

#99: **Hypothesis testing about the means of fuzzy random variables.**

Presenter: ..... Ana Colubi@University of Oviedo, Spain
Co-authors: ..... M. Angeles Gil

Fuzzy random variables (FRVs for short) model random mechanisms associate with each experimental outcome imperfect values. That is, FRVs are considered to manage random experiments involving imprecisely-valued characteristics, so that data available from the experimental performance can be properly described by means of fuzzy sets. FRVs are particularly useful in handling the imprecision underlying many real-life perceptions, classifications and judgements. In the last years an inference statistical methodology concerning fuzzy random variables (especially estimation and testing about the fuzzy mean value) has been developed. In this communication we focus on the problem of testing about the fuzzy mean of an FRV. Methods for the one-sample, two-sample and multi-sample (ANOVA) problem are discussed. The procedures are illustrated by means of real-life example and empirical studies are discussed.

#102: **Fuzzy techniques in the analysis of distributions of real random variables.**

Presenter: ..... Gil Gonzalez-Rodriguez@European Center for Soft Computing, Spain

Some random variables which are traditionally modelled as ordinal variables or simply coded as a real-valued one can be intuitively and more expressively modelled by means of fuzzy random variables. This is the case of the forest fire index, which is usually fixed to range in a discrete scale from 1 to 5 (1 meaning risk absence and 5 being associated with the maximum risk). The different nature of the extreme values along with the lack of precision underlying the discretization process suggest the possibility of representing them by means of adequate fuzzy sets capturing these features. On the other hand, the empirical comparison of the hypothesis testing about means for fuzzy random variables and real-valued ones, allows us to conclude that in most of the cases conclusions are definitely more powerful for the first ones. Motivated by these two arguments, some suitable fuzzifications of real-valued random variables have been suggested. Especially interest are paid to those for which the fuzzy mean value of the transformed original variable fully characterizes its distribution. In this communication, some of these fuzzifications are presented and a discussion about their statistical implications is considered.

CS01 Room: E003 TIME SERIES AND FINANCIAL ECONOMETRICS Chair: Christian Francq

#15: **Asymptotic properties of sample inverse autocorrelations under weak assumptions**

Presenter: ..... Ahmed El Ghini@Universite Lille 3, France

The inverse autocorrelation function has been widely used in time series literature. The function is defined via the inverse of the spectral density, and plays an important role in the identification and estimation of ARMA models. Most of the studies assume that the innovations of the linear time series are independent and identically distributed. On the other hand, there are many applications in which this strong assumption is either questionable or clearly inadequate. For example, most empirical time series in business and finance exhibit nonlinearity and conditional heteroscedasticity. This paper is devoted to asymptotic properties of the estimates of the inverse autocorrelation function derived by the orthogonality method. Under weak dependence assumptions, it is established that the estimates are consistent and asymptotically normal. An application to linear processes with GARCH innovations is discussed. A Monte Carlo study illustrates the theoretical results and shows that the method performs well in finite samples, for various kinds of non-linear processes. An application to a real financial data is provided.

#9: **Econometric asset pricing modelling**

Presenter: ..... Fulvio Pegoraro@Banque de France, France
Co-authors: ..... Henri Bertholon, Alain Monfort

The purpose of this paper is to propose a general econometric approach to asset pricing modelling based on three main ingredients : (i) the historical discrete-time dynamics of the factor representing the information, (ii) the Stochastic Discount Factor (SDF), and (iii) the discrete-time risk-neutral (R.N.) factor dynamics. Retaining an exponential-affine specification of the SDF, its modelling is equivalent to the specification of the factor loading vector and of the short rate, if the latter is neither exogenous nor a known function of the factor. In this general framework, we distinguish three modelling strategies: the Direct Modelling, the Risk-Neutral Constrained Direct Modelling and the Back Modelling. In all the approaches we study the internal consistency constraints, implied by the absence of arbitrage opportunity (AAO) assumption, and the identification problem. We also propose interpretations of the factor loading vector in terms of market price of risk. The general modelling strategies are applied to two important cases: security market models and term structure of interest rates models. In the context of security market models, we show the relevance of our methods for various kinds of specifications: switching regime models, stochastic volatility models, Gaussian and Inverse Gaussian GARCH-type models (with or without regime-switching). In the interest rates modelling context, we consider several illustrations: VAR modelling, Switching VAR modelling and Wishart modelling. We also propose, using a Gaussian VAR(1) approach, an example of joint modelling of geometric returns, dividends and short rate. In these contexts we stress the usefulness

of the Risk-Neutral Constrained Direct Modelling approach and of the Back Modelling approach, both allowing to conciliate a flexible historical dynamics and a Car R.N. dynamics leading to explicit or quasi explicit pricing formulas for various derivative products. Moreover, we highlight the possibility to specify asset pricing models able to accommodate non-affine historical and R.N. factor dynamics with tractable pricing formulas.

#48: **Testing the nullity of GARCH coefficients : correction of the standard tests and relative efficiency comparisons**

Presenter: Jean-Michel Zakoian@CREST and University Lille 3, France
Co-authors: Christian Francq

This article is concerned by testing the nullity of coefficients in GARCH models. The problem is non standard because the quasi-maximum likelihood estimator is subject to positivity constraints. The paper establishes the asymptotic null and local alternative distributions of Wald, score, and quasi-likelihood ratio tests. Efficiency comparisons under fixed alternatives are also considered. Two cases of special interest are: (i) tests of the null hypothesis of one coefficient equal to zero and (ii) tests of the null hypothesis of no conditional heteroscedasticity. The results are illustrated by means of simulation experiments. An empirical application to the Standard & Poor 500 and the CAC40 indexes is proposed.

#53: **A guided tour of periodic time series models and applications**

Presenter: Antony Gautier@Universite Lille 3, France

Seasonal or periodic statistical structures of time series have been extensively exhibited in economics. For such data the standard Box-Jenkins methodology applies and rests on seasonal ARIMA (SARIMA) models with time-constant coefficients. Periodic models, where the parameters vary periodically with time, have however gained considerable interest. A review of some recent results for periodic ARMA (PARMA) or periodic bilinear models is provided. Applications of PARMA models to a real series dealing with French motorway traffic and comparisons with seasonal ARMA models are also presented.

CS04 Room: B013 DECISION MAKING UNDER UNCERTAINTY Chair: Daniel Kuhn

#13: **Fractal scaling in crude oil price evolution via time series analysis of historical data**

Presenter: Dimitrios Gerogiorgis@Imperial College London, UK
Co-authors: Efstratios Pistikopoulos

Time series data often arise when monitoring industrial processes or tracking corporate business metrics; in this case, we are interested in the evolution of crude oil prices over several decades. Its definitive characteristic is that time series analysis accounts for the fact that data points taken over time may have an internal structure (autocorrelation, trend or seasonal variation) that should be accounted for, and can actually be analyzed quantitatively. In many statistical autocorrelation studies of intra-day financial time series data, it has been identified that the absolute value of price changes behave as fractional noise. The mean absolute price change yields a linear correlation to the analysis time interval size, in logarithmic coordinates, effectively indicating that price changes obey a scaling law; intrinsic frequencies may span several orders of magnitude, yet they can be conclusively identified and studied. This paper presents historical price data for various crude oil types, applying different degrees of time resolution; results are interrelated in order to identify patterns and analyze variation timescales. A specific goal is to investigate the presence of fractal properties - the hypothesis that the mean size of the absolute values of price changes follows a fractal scaling (power law) as a function of the analysis time interval. The analysis reveals some interesting trends, which are useful for understanding seasonality but also the intrinsic structure of crude oil markets.

#28: **Evaluating and extending clustering techniques to generate financial scenarios for stochastic programming models**

Presenter: Ronald Hochreiter@University of Vienna, Austria

A successful application of stochastic programming models for financial optimization under uncertainty necessitates a careful generation of underlying scenarios, which represent the uncertain future. Once an appropriate econometric time series model is estimated and sample trajectories are simulated, various clustering techniques can be employed to create an appropriate set of optimal scenarios, given some predetermined optimality conditions chosen by the respective decision taker. We show how different clustering approaches as well as different optimality conditions influence the final decision, and how the underlying clustering techniques can be modified to obtain additional information, e.g. upper and lower bounds on the objective function. Numerical results for static and dynamic financial portfolio optimization problems will be presented.

#33: **Option pricing on non-recombining implied trees assuming serial dependence of returns**

Presenter: Eleni Constantinide@University of Cyprus, Cyprus
Co-authors: Chris Charalambous, Spiros Martzoukos

The non-recombining implied tree is calibrated by taking into account serial dependence of stock returns. Effectively, the model becomes non-Markovian. Unlike typical preference-free option pricing models, a parameter related to the expected return of the underlying asset appears in the model. We calibrate the non-Markovian model using European calls on the FTSE 100 index for year 2003. Results strongly support our modelling approach. Pricing results are smooth without evidence of an over-fitting problem and the derived implied distributions are realistic. Also, results for the pricing of American call options indicate that the non-Markovian model outperforms the equivalent Markovian model and also an ad-hoc procedure of smoothing Black-Scholes implied volatilities.

#243: **Optimal derivative Insurance for robust portfolio optimisation**

Presenter: Steve Zymler@Imperial College London, UK
Co-authors: Berc Rustem, Daniel Kuhn

In this paper we describe a one period portfolio optimization model which extends the robust portfolio models by giving strong guarantees on the worst-case terminal portfolio wealth. The model guarantees this via optimally chosen stock underlier and derivative allocation as well as optimally determined derivative strike prices. We show that this model is an intuitive extension of the standard robust optimization framework, which only gives weak guarantees on the worst-case expected portfolio wealth should the unknown parameters materialize within the uncertainty sets. The model we obtain is a non-convex bilinear program which we solve using a deterministic Branch-and-Bound algorithm. We provide simulated backtest performance to evaluate this new model in comparison with standard robust optimization and classical mean-variance optimization models and evaluate how this model performs under normal market conditions as well as during market crashes.

#123: **Dynamic mean-variance portfolio analysis under model risk**

Presenter: Daniel Kuhn@Imperial College London, UK
Co-authors: Panos Parpas, Berc Rustem

The classical Markowitz approach to portfolio selection is compromised by two major shortcomings. First, there is considerable model risk with respect to the distribution of asset returns. Especially mean returns are notoriously difficult to estimate. Moreover, the Markowitz approach is static in that it does not account for the possibility of portfolio rebalancing within the investment horizon. We propose a robust dynamic portfolio optimization model to overcome both shortcomings. The model arises from an infinite-dimensional min-max framework. The objective is to minimize the worst-case portfolio variance over a family of dynamic investment strategies subject to a return target constraint. The worst-case variance is evaluated with respect to a set of conceivable return distributions. We develop a quantitative approach to approximate this intractable infinite-dimensional problem by a finite-dimensional one and report on numerical experiments.

CS06 Room: GGA MULTIVARIATE GARCH Chair: Marc Paolella

#16: **CHICAGO: a fast and accurate method for portfolio risk calculation**

Presenter: Simon Broda@University of Zurich, Switzerland
Co-authors: Marc Paolella

The estimation of multivariate GARCH models remains a challenging task, even in modern computer environments. This manuscript shows how Independent Component Analysis can be used to estimate the Generalized Orthogonal GARCH model in a fraction of the time otherwise required. The proposed method is a two-step procedure, separating the estimation of the correlation structure from that of the univariate dynamics, thus facilitating the incorporation of non-Gaussian innovations distributions in a straightforward manner. The generalized hyperbolic distribution provides an excellent parametric description of financial returns data and is used for the univariate fits, but its convolutions, necessary for portfolio risk calculations, are intractable. This restriction is overcome by a saddlepoint approximation to the required distribution function, which is computationally cheap and extremely accurate – most notably in the tail, which is crucial for risk calculations. A simulation study and an application to stock returns demonstrate the validity of the procedure.

#23: **Optimal portfolio allocation using daily correlation modelling**

Presenter: Charles Bos@VU University Amsterdam, Netherlands
Co-authors: Roman Kraeussl

Traditional mean-variance efficient portfolios do not capture the potential wealth creation opportunities provided by predictability of asset returns. This paper examines the benefits of actively managed portfolio diversification that accrue to a representative foreign investor who considers international investment opportunities among six major Euro-area countries. To do so, we specify two advanced models for time-varying mean, variances and correlations and compare their results with standard portfolio allocation strategies like the buy-and-hold and fixed weight strategies. Our empirical findings indicate that models incorporating stochastic correlation and volatility result in significantly higher returns than GARCH-based variants or naive portfolio optimisation.

#29: **Sequential conditional correlations: inference and evaluation**

Presenter: Alessandro Palandri@University of Copenhagen, Denmark

This paper presents a new approach to the modeling of conditional correlation matrices within the multivariate GARCH framework. The procedure, which consists in breaking the matrix into the product of a sequence of matrices with desirable characteristics, in effect converts a highly dimensional and intractable optimization problem into a series of simple and feasible estimations. This in turn allows for richer parameterizations and complex functional forms for the single components. An empirical application involving the conditional second moments of 69 selected stocks from the NASDAQ100 shows how the new procedure results in strikingly accurate measures of the conditional correlations.

#251: **Semiparametric vector MEM**

Presenter: Giampiero Gallo@Universita di Firenze, Italy
Co-authors: Fabrizio Cipollini

The Multiplicative Error Model for non negative valued processes is specified as the product of a (conditionally autoregressive) scale factor and an innovation process with non negative support. In this paper we propose an alternative multivariate extension of such a model, by taking into consideration the possibility that the vector innovation process be contemporaneously correlated. The estimation procedure is hindered by the lack of probability density functions for multivariate positive valued random variables. We extend the model and suggest the use of Generalized Method of Moments to jointly estimate the parameters of the scale factors and of the correlations of the innovation processes. We illustrate the feasibility of the procedure and the gains over the equation by equation approach using a three variable fully interdependent model with volume, average volume per trade and realized volatility as variables.

CS13 Room: B103 APPLIED MACROECONOMETRICS Chair: Martin Wagner

#31: **Fiscal policy in open economies**

Presenter: Klaus Neusser@University of Bern, Switzerland
Co-authors: Harris Dellas, Manuel Walti

We argue that the significance of the exchange rate regime for the effectiveness of fiscal policy in small open economies has been exaggerated in the literature. Using the New Keynesian (NK) open economy model we demonstrate that the form of the domestic policy rule pursued under flexible rates and the degree of international capital mobility play a more important role. We investigate the effects of government spending shocks in 21 countries using a VAR identification scheme which has been previously suggested. Consistent with the NK theory (and in contradiction to the IS-LM predictions), we find that the size of the fiscal multiplier does not vary systematically with the exchange rate regime. The degree of capital mobility and trade openness also seem to exert limited influence.

#39: **The role of sectoral shifts in the great moderation**

Presenter: Daniel Burren@University of Bern, Switzerland

This paper thoroughly estimates how much sectoral shifts contributed to the drop of real GDP volatility which has been observed in the United States during the postwar period. I find that if in the year 1949 sectoral shares had been equal to what they were in 2005, then the conditional and unconditional standard deviation of GDP growth would have been, on average, 20-25% lower in the postwar period. Finally, I find that the shift out of durable goods production has significantly stabilized real GDP growth. As a methodological contribution, I show how to use the particle filter to estimate latent covariance matrices when they follow a Wishart autoregressive process of order one. I use this in order to get, for each observation period, an estimation of the covariance matrix of the sectoral growth rates. Since real GDP growth is the sum of these sectoral growth rates weighted by the sectoral shares, it is then straightforward to use these covariance matrices to express the conditional variance of GDP growth in each period as a function of sectoral shares. Computing the unconditional variance of GDP growth as a function of sectoral shares is a bit more involved but also quite easy using Monte Carlo simulations.

#56: **Business cycle accounting with model consistent expectations**

Presenter: Gregor Baeurle@University of Bern, Switzerland
Co-authors: Daniel Burren

Business Cycle Accounting has recently been advocated as an RBC model based method to guide researchers in developing quantitative models of economic fluctuations. It requires researchers to make assumptions about the expectation formation by agents in the RBC model. It is standard to assume that expectations are formed as if wedges followed a vector autoregressive process of order one (VAR(1)). We show that this assumption is not generally valid and in particular not valid for some widely used models. We then provide an alternative, model-consistent approach to modeling expectation formation. On the former issue, we present a necessary and sufficient rank condition under which a detailed economy can be mapped into a benchmark model where wedges follow a VAR(1) process. On the latter issue, we suggest that the information set underlying the expectation formation should not only contain current wedges, but also all predetermined variables. We then apply our extended procedure to investigate which kind of models are promising for explaining the Great Moderation - the decline of variability of macroeconomic variables in the US beginning in the early eighties. Our results suggest that a break in the labor wedge is able to explain the major part of the Great Moderation.

#67: **Nonlinear cointegration analysis of the enivronmental kuznets**

Presenter: Martin Wagner@Institute for Advanced Studies, Austria
Co-authors: Seung Hyun Hong

The environmental Kuznets curve (EKC) postulates an inverse U-shaped relationship between income (typically proxied by per capita GDP) and measures of pollution (often proxied by emissions). The empirical strategy of EKC estimation typically consists of regressing a pollution measure on GDP, GDP squared and sometimes other explanatory variables. If GDP is a unit root process, then such a regression involves a unit root process and its square (and maybe higher order terms). Up to now the literature has ignored the fact that such regressions behave in many ways differently than 'linear cointegrating' regressions. In this paper we

consider OLS estimation and fully modified OLS estimation as well as specification testing for regression equations including deterministic variables, stationary regressors and integrated regressors and their integer powers. The properties of the estimators resemble in many ways those in the linear case. The performance of the estimators and tests is investigated by means of a simulation study. In the empirical part we analyze the relationship between per capita GDP and per capita CO2 and SO2 emissions for a set of 19 early industrialized countries. We find support for the prevalence of an inverted U-shaped relationship only for few countries. The methodology developed here can be applied far beyond the EKC analysis originally motivating the present paper.

CS17 Room: AUM DYNAMIC FACTOR MODELS: ANALYSIS AND REAL-TIME FORECASTING Chair: Christian Schumacher

#54: **Real time forecasts of inflation: the role of financial variables**

Presenter: ..... Gianluca Moretti@Banca d'Italia, Italy
Co-authors: ..... Libero Monteforte

The aim of this work is to present a model to forecast short-term inflation. We develop a model that combines both the low frequency information of a monthly core inflation index and the high frequency of daily data from financial markets. We estimate this model using mixed frequency data for the euro area with the recent technique of MIDAS regression. Then we evaluate the forecasting ability of the model in real time, with respect to standard VAR models and the daily quotes of the economic derivatives on euro area inflation. Our results find that the inclusion of the daily variables helps to reduce the forecasting errors with respect to models that consider only monthly variables. Furthermore, our models also have a better predictive power than that of the economic derivatives.

#185: **Forecasting performance of dynamic factor models in short samples with structural breaks**

Presenter: ..... Victor Bystrov@University of Lodz, Poland

Macroeconomic data available for emerging market economies are characterized by short time spans and sharp shocks. Short spans of data suggest the adoption of simple autoregressive models as forecasting tools. However, the availability of a large number of variables makes the class of dynamic factor models a reasonable alternative. In this paper the relative forecasting performance of these two types of models is explored in the Monte Carlo exercise performed for the data spans which are available for emerging market economies. The data generating processes include structural breaks in their common and idiosyncratic components. Dependence of the relative forecasting performance of the models on the size and timing of breaks is studied. Multi-step forecasts are evaluated. It is found that the timing and the type of the break are important and can reverse the relative performance of the models.

#49: **Factor-MIDAS for now- and forecasting with ragged-edge data: a model comparison for German GDP**

Presenter: ..... Christian Schumacher@Deutsche Bundesbank, Germany
Co-authors: ..... Massimiliano Marcellino

This paper compares different ways to now- and forecast GDP using factor models that can handle large ragged-edge datasets. The ragged-edge unbalancedness is due to statistical publication lags, and implies missing values at the end of the sample. We compare three different factor estimators: principal components based on realigned data, the Expectation-Maximisation algorithm with principal components, and the state-space Kalman smoother. To forecast quarterly GDP with monthly factors, we introduce different versions of factor-based mixed-data sampling (Factor-MIDAS). In the empirical application, we compare different combinations of factor estimators and Factor-MIDAS with respect to their forecast performance of German GDP.

#93: **Generalized linear dynamic factor models - a structure theory**

Presenter: ..... Manfred Deistler@Vienna University of Technology, Austria
Co-authors: ..... Brian D.O. Anderson

We present a structure theory for generalized linear dynamic factor models (GDFM's). GDMF's are a combination and generalization of linear dynamic factor models with strictly idiosyncratic noise and generalized linear static factor models; they have been proposed and developed in a number of papers by Forni, Lippi, Hallin and Reichlin and Stock and Watson. GDFM's provide a way of overcoming the "curse of dimensionality" plagueing multivariate time series modelling, provided that the single time series show comovement. We consider a stationary framework; the observations are represented as the sum of two uncorrelated component processes: The so called latent process, which is obtained from a dynamic linear transformation of a low- dimensional factor process and which shows strong dependence of its com- ponents, and the noise process, which shows weak dependence of the components. The latent process is assumed to have a singular rational spectral density. For the analysis, the cross-sectional dimension n, i.e. the number of single time series is going to infinity; the decomposition of the observations into these two components is unique only for n tending to infinity. We present a structure theory giving a state space or ARMA realization for the latent process, commencing from the (population) second moments of the observations. The main parts are: Factorization of singular rational spectral densities into tall transfer functions, realization of state space and ARMA systems from a finite number of covariances of the latent process and the averaging out of the noise effects for n tending to infinity. Special emphasis is given to the case where the transfer function has no zeros. This corresponds to the autoregressive case. As opposed to the case of square transfer functions, for tall transfer functions, this property is generic. The role of Kronecker indices for determining the number of covariances needed is analysed. Based on this structure theory an estimation procedure based on sample second moments is proposed.

CS18 Room: ALG FINANCIAL ECONOMETRICS - 1 Chair: Michael Wolf

#57: **Option pricing with aggregation of physical models and nonparametric statistical learning**

Presenter: Loriano Mancini@University of Zurich, Switzerland
Co-authors: Jianqing Fan

Parametric option pricing models are largely used in Finance. These physical models capture several features of asset price dynamics. However, their pricing performance can be significantly enhanced when they are combined with nonparametric learning approaches, that learn and correct empirically the pricing errors. In this paper, we propose a new nonparametric method for pricing derivatives assets. Our method is based on a physical model-guided nonparametric approach to estimate the state price distribution, called the Automatic Correction of Errors (ACE). This method is easy to implement and can be combined with any model-based pricing formula to correct the systematic biases of pricing errors. We also develop a nonparametric test to show the efficacy of the ACE method. Empirical studies based on S&P 500 index options show that our method outperforms several competing pricing models in terms of predictive and hedging abilities.

#60: **Robust fast subsampling for time series**

Presenter: Lorenzo Camponovo@University of Lugano, Switzerland
Co-authors: Olivier Scaillet, Fabio Trojani

We introduce the quantile breakdown point of a general block resampling procedure for time series and show that it implies fragile resampling quantiles in many relevant settings. To solve this robustness problem, we develop a general robust fast subsampling method for time series, which is applicable also in nearly integrated models. Our approach bounds the impact of outliers or general model deviations by means of a resampling procedure applied to a bounded score function. We also propose a data driven calibration procedure to select contemporaneously the relevant block size and the degree of robustness needed in applications. Monte Carlo simulation and sensitivity analysis strongly supports the usefulness and the power of our robust subsampling method relative to competing alternatives under several forms of data generating processes. An application to testing for the predictability of stock returns illustrates the methodology in a real data example.

#109: **The sensitivity of nonparametric misspecification tests to disturbance autocorrelation**

Presenter: Andrea Vaona@University of Lugano, Switzerland

Ramsey's regression specification test (RESET) was showed to have serious size problems in presence of disturbance serial correlation. Various nonparametric specification tests were offered in the literature and a few of them managed to survive earlier simulation exercises. As a matter of consequence the present study focuses on the latter ones and on further, more recent statistics. We show that some nonparametric specification tests can be robust to disturbance autocorrelation. This robustness can be affected by the specification of the true model and by the sample size. Once applied to the prediction of changes in the Euro Repo rate by means of an index based on ECB wording, we find that the least sensitive nonparametric tests can have a comparable performance to a RESET test with robust standard errors.

#55: **Robust performance hypothesis testing with the Sharpe ratio**

Presenter: Michael Wolf@University of Zurich, Switzerland
Co-authors: Olivier Ledoit

Applied researchers often test for the difference of the Sharpe ratios of two investment strategies. A very popular tool to this end is the test of Jobson and Korkie, which has been corrected by Memmel. Unfortunately, this test is not valid when returns have tails heavier than the normal distribution or are of time series nature. Instead, we propose the use of robust inference methods. In particular, we suggest to construct a studentized time series bootstrap confidence interval for the difference of the Sharpe ratios and to declare the two ratios different if zero is not contained in the obtained interval. This approach has the advantage that one can simply resample from the observed data as opposed to some null-restricted data. A simulation study demonstrates the improved finite sample performance compared to existing methods. In addition, two applications to real data are provided.

CS25 Room: B217 CREDIT RISK, FINANCIAL MARKETS AND COMPUTATIONAL METHODS Chair: Sandra Paterlini

#85: **Forecasting the default probability without accounting data**

Presenter: Dean Fantazzini@Moscow State University, Russia

The recent default of the multinational giants Enron and WorldCom clearly showed how accountancy data can be misleading and far away from the true financial situation of a company. When financial fraud takes place, the models that use accountancy data to predict default probabilities cannot be used since their forecasts are completely unreliable. To avoid such problems, we propose a novel approach that uses stock prices only, and allows to model departures from normality in stock returns dynamics, too. The parametric bootstrap, based on a conditional marginal model, is used to estimate the distribution of these estimated probabilities and to construct confidence bands. We show an empirical example with both operative and defaulted Italian, American and Russian stocks.

#107: **Optimization heuristics for determining internal rating grading scales**

Presenter: Johannes Paha@Justus-Liebig-Universitaet, Giessen, Germany
Co-authors: Marianna Lyra, Peter Winker, Sandra Paterlini

Basel II imposes minimum capital requirement on banks related to the default risk of their credit portfolio. Banks using an internal rating approach compute the minimum capital requirements from pooled probabilities of default (PD). These pooled probabilities can be calculated by clustering credit borrowers into different buckets. The clustering problem can become very complex when the Basel II regulations and real-world constraints are taken into account. Search heuristics have already proven remarkable performance in tackling this problem as complex as it is. An implementation of the Threshold Accepting is proposed, which exploits the inherent discrete nature of the clustering problem. It is demonstrated that it can be a valuable alternative to methodologies already proposed in the literature, such as standard k-means and Differential Evolution. Besides proposing new clustering objectives, we extend the analysis further by introducing a new method to determine not only the optimal clustering structure but also the optimal number of buckets in which to cluster the bank clients. This is done by imposing a constraint that allows for a meaningful ex post validation of the cluster structure.

#115: **Least median of squares estimation by optimization heuristics with an application to the CAPM**

Presenter: Marianna Lyra@Justus-Liebig University, Germany
Co-authors: Peter Winker, Chris Sharpe

For estimating the parameters of models for financial market data at higher frequency, the use of robust techniques is of particular interest. While only the most basic capital asset pricing model (CAPM) is considered, extensions to more refined models are straightforward. It is proposed to consider least median of squares (LMS) estimators in this context. Given the complexity of the objective function, the estimates are obtained by means of optimization heuristics. The performance of two heuristics is compared, namely differential evolution and threshold accepting. It is shown that these methods are well suited to obtain least median of squares estimators for real world problems such as the CAPM. Furthermore, it is analyzed to what extent parameter estimates and conditional forecasts based on the LMS differ from those obtained by OLS. The empirical analysis considers some stocks from the Dow Jones Industrial Average Index (DJIA) for different sample periods. Although estimation appears to be feasible using the heuristics proposed, the findings for the CAPM are rather mixed.

#161: **Systemic risk in the European banking system**

Presenter: Andrea Cipollini@University of Modena and Reggio Emilia, Italy
Co-authors: Franco Fiordelisi

The issue of systemic risk among European banks has been recently explored by using only listed banks. In our paper we use a large dataset which includes both listed and non listed banks in Europe. Financial distress for a specific bank in a given country is defined in terms of the lowest quartile of an indicator of bank performance, the Economic Value Added, EVA. The analysis of systemic distress, defined as the joint probability of financial distress in two or more countries, is carried using an high dimensional multivariate probit. As an alternative to a computationally intensive ML estimation method used to retrieve joint probabilities, we suggest an alternative procedure based upon two stages. In the first stage, the common factor loadings are obtained via a GMM type of analysis. The moment conditions are obtained by computing the reduced form pairwise joint probabilities of distress using a time averaged estimator of stochastic migration into distress. Once the common factor loadings have obtained by GMM, we compute the probability of distress in two or more coutries through stochastic simulation, modelling the latent factor as a Gaussian common shock. We also explore which risk factors underlie systemic distress.

#122: **Estimating risk capital for correlated rare events**

Presenter: Tina Yener@Ludwig-Maximilians-University Munich, Germany
Co-authors: Stefan Mittnik

Operational Risk, that is, the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events, is a very heterogeneous risk class, including events such as bookkeeping errors and terrorist attacks. Modeling dependencies between individual operational-loss categories is of major interest to financial institutions, as they affect the estimation of regulatory minimum-capital requirements. With a focus on rare events, we demonstrate that the use of correlations to model dependencies among risk categories might lead to a counterintuitive behavior of risk measures, such as Value-at-Risk (VaR) and Expected Shortfall (ES): Their value may decrease as correlation increases. Hence, the goal of reducing minimum capital requirements by incorporating less than perfect correlations, as suggested by the New Basel Capital Accord (Basel II), may not necessarily be attainable. We discuss the behavior of VaR and ES measures under different simulation designs and ways of improving the reliability of their estimates in the context of rare events.

Thursday 19.06.2008 14:00-16:00 Parallel Session C

ES06 Room: GGA COMPUTATIONAL METHODS FOR MIXTURES Chair: Sylvia Fruehwirth-Schnatter

#19: **Finite mixture model diagnostics using the bootstrap**

Presenter: Bettina Grun@Wirtschaftsuniversitat Wien, Austria
Co-authors: Friedrich Leisch

The EM algorithm provides a common framework for maximum likelihood estimation of finite mixture models. The fitted models can differ with respect to the component specific models and may also allow for concomitant variables to model the component weights. The use of resampling methods to analyze finite mixture models fitted with the EM algorithm is appealing because the bootstrap similarly to the EM algorithm constitutes a common framework for these models. In addition standard asymptotic theory can sometimes be not directly applied to finite mixtures due to violation of regularity conditions. In this talk we will outline various possibilities to use bootstrapping for model diagnostics such as for determining the number of components, checking model identifiability and analyzing the stability of induced clusters. The application of the diagnostic tools is demonstrated on several examples.

#15: **A flexible prior distribution for markov switching autoregressions with student-t errors**

Presenter: Philippe Deschamps@University of Fribourg, Switzerland

This paper proposes an empirical Bayes approach for Markov switching autoregressions that can constrain some of the state-dependent parameters (regression coefficients and error variances) to be approximately equal across regimes. By flexibly reducing the dimension of the parameter space, this can help to ensure regime separation and to detect the Markov switching nature of the data. The permutation sampler with a hierarchical prior is used for choosing the prior moments, the identification constraint, and the parameters governing prior state dependence. The empirical relevance of the methodology is illustrated with an application to quarterly and monthly real interest rate data.

#14: **On mixture of Kalman filtering and learning**

Presenter: Hedibert Lopes@University of Chicago, USA
Co-authors: Nicholas Polson, Carlos Carvalho, Michael Johannes

In this paper we present a novel particle filtering and learning strategy for a wide class of state space models that can be represented as mixture of dynamic linear models (DLMs). These methods provide samples from the joint posterior distribution of states and parameters, in a sequential fashion, avoiding the burden of hard to converge MCMC samplers. Our methodology provides an extension to the mixture of Kalman filters and naturally incorporates nonlinearities in the state dynamics. We use conditional sufficient statistics for parameter learning and we extend this approach to state filtering whenever possible. We provide two applications. First, a dynamic factor switching model which illustrates the efficiency gains over traditional methods. Second, we analyze a nonlinear model that has been extensively considered in the pure filtering literature, where we also add sequential parameter learning.

#3: **Bayesian estimation of finite mixtures of univariate and multivariate skew-normal and skew-t distributions**

Presenter: Sylvia Fruehwirth-Schnatter@Johannes Kepler University Linz, Austria

Skewnormal and skew-t densities, both for univariate as well as multivariate data sets, have been introduced with the goal of capturing skewness and kurtosis without loosing unimodality of the fitted distribution. Very recently, finite mixtures of such densities have been introduced for the purpose of robust clustering. Rather little work has been done on efficient statistical estimation of such mixtures and in the present paper Bayesian inference is carried out. For mixtures of univariate and multivariate skewnormal densities, we develop MCMC estimation based on data augmentation and Gibbs sampling. The first step of data augmentation and the Gibbs sampler is based on the standard procedure of drawing classification using the skew components densities. To carry out parameter estimation within each component, we use a second step of data augmentation based on a stochastic representation of the uni- and the multivariate skewnormal density in terms of a random-effect models with truncated normal random effects. This allows drawing the parameters from standard density. This MCMC scheme is extended to univariate and multivariate mixtures of skew-t densities through a third step of data augmentation based on representing the t-density as scale mixtures of normals.

ES17 Room: GB1 PROBABILISTIC METHODS IN LEARNING PROBLEMS Chair: Ana Colubi

#67: **Probabilistic fuzzy systems in financial modelling**

Presenter: Uzay Kaymak@Erasmus University Rotterdam, Netherlands

Probabilistic fuzzy systems (PFS) are semi-parametric models in which a linguistic description of the system behaviour encoded by the fuzzy rules can be combined with the statistical properties of the data. Mathematically, they are related to neural networks, support vector machines, kernel models and Parzen window density estimators. They are interesting as they allow the modeler to focus on the experts' information coded linguistically while the model itself has strong theoretical grounding. All common fuzzy models can be extended to their probabilistic fuzzy equivalents. In this paper we study probabilistic fuzzy equivalents of Mamdani fuzzy systems and zero-order Takagi-Sugeno fuzzy systems. We consider their main characteristics and discuss how they can be

applied in financial modelling. In particular, attention is paid to value-at-risk estimation by using probabilistic fuzzy systems. A sequential approach is proposed for determining the model parameters, where the location of the antecedent membership functions is determined by using fuzzy clustering while maximum likelihood parameter estimation is used for determining the probability parameters of the PFS. The validity of the VaR models obtained is evaluated by using a statistical back-testing method (Kupiec test) based on failure rates.

#49: **Parameter-free feature selection with mutual information**

Presenter: . . . . . Michel Verleysen@Universite Catholique de Louvain, Belgium
Co-authors: . . . . . Damien Francois

Machine learning of high-dimensional data faces the curse of dimensionality, a set of phenomena that limit the performance of the tools. Many limitations come directly from the representation of the data, and not from the analysis tool. It is therefore needed to reduce the data dimensionality. There are basically two ways to do this: either to select features among the original variables, or to project the latter on new ones. Although more general and thus more powerful in theory, projecting features induces a loss of interpretability. On the contrary, by selecting original features, one can come back to the application and interpret which are the relevant factors for the analysis; this is important advantage in many applications. This paper shows how to use Mutual Information (MI) for feature selection. In practice, the MI criterion has to be estimated and the search for possible feature subsets restricted for computation time reasons. It is shown how to use resampling and permutation tests to select optimal parameters for the estimator, and to stop the search procedure in a sound way. It is also shown how to design an estimator of feature subset relevance inspired from the mutual information criterion, with the supplementary advantage to restrict the estimation to a two-dimensional problem.

#87: **Fuzzy text mining and digital obesity**

Presenter: . . . . . Trevor Martin@University of Bristol, UK
Co-authors: . . . . . Yun Shen

The phrase *digital obesity* summarises a range of problems arising from our propensity to generate and retain a rapidly growing volume of data, at web-scale as well as at corporate and personal scales. Much of this data is in text form, but is effectively wasted unless we can find and use the *right* data when needed. Statistical methods help to a degree, but tend to *average out* useful information, as well as suffering from a mismatch between the precisely defined terms used by formal models and the far more subtle and expressive terms used in human communication. Humans communicate using language where the majority of concepts are fuzzy, defined by common usage rather than by necessary and sufficient conditions. The success of fuzzy control is one example where fuzzy set theory enabled computers to work with ill-defined terms such as *hot* and *slow* rather than precise values. Fuzziness enables computers to work with ill-defined concepts, leading to more effective use of text-based information in business and other situations. Although the input information is rarely complete (and may be incorrect) the approximately correct solutions are generally sufficient as well as being easier to compute and understand.

#96: **The estimation of prediction error for neural networks: a simulation study.**

Presenter: . . . . . Simone Borra@University of Rome "Tor Vergata", Italy
Co-authors: . . . . . Agostino Di Ciaccio

One fundamental problem in statistics is that of obtaining an accurate estimate of the prediction error, i.e. the expected loss on future observations, of a learning algorithm trained on the available sample data. This problem has particular relevance every time a very large sample is not available, the underlying distribution is not known and you need to evaluate the prediction error of a non-parametric model which could overfit data. The simplest estimator of prediction error is the Apparent Error defined as the average of the loss function on the training data-set. Apparent error usually produces an optimistic estimate of prediction error because it uses the same data both for training and for evaluation of the model. Using powerful non-linear models, as Neural Networks, it is possible to obtain very small values of Apparent Error, just including more parameters in the model. A way to evaluate the prediction error of the model is to estimate the Optimism, defined as the expected difference between the prediction error and the Apparent Error on new training data, adding it to the Apparent Error. We considered several approaches to prediction error estimation for Neural Networks. In particular, estimators based on Cross-Validation (as Leave-one-out, K-fold cross-validation) and Repeated Cross-Validation (obtained averaging a set of cross-validation estimates on different random split); estimators based on non-parametric Bootstrap (as 0.632 bootstrap and the modified version 0.632+ to take into account situations of severe overfit) and parametric Bootstrap (where the Optimism is proportional to a covariance term estimated by Bootstrap). Using an extensive simulation approach we were able to compare the estimators with respect to different characteristics of data. We considered a regression problem with 1000 data generating distributions showing different level of non-linearity and signal/noise ratio. In each population, we drew 30 samples on which we trained two different NN, calculating also all estimators of prediction error. We generated also a very large sample from each population, to obtain a reliable estimation of the true prediction error for each NN. Finally, we compared all prediction error estimators on the bases of bias and variability. We obtained some interesting suggestions about the efficiency of the different prediction error estimators with respect to the s/n ratio and the neural network complexity.

#114: **Application of neural networks and support vector machines to pricing European options**

Presenter: . . . . . Chris Charalambous@University of Cyprus, Cyprus

Artificial Neural networks (ANN), as discipline, studies the information processing capabilities of networks made up of simple processors which are in some way connected with different strengths (weights) like the living neurons of the brain. During the

training phase the connecting weights are modified so that the network output matches the required response (target values) as closely as possible. The multilayer neural network is the most widely used type of neural networks. It consists of an input layer a number of hidden layer and an output layer. There are several issues involved in designing a multilayer neural network: Selecting the number of hidden layers, the number of neurons in each hidden layer, finding the global solution. Support Vector Machine (SVM) models are close cousin to classical multilayer neural networks and overcome the above limitations of neural networks. The weights of the network are found by solving a positive definite quadratic programming problem, rather than by solving a non convex, unconstrained minimization problem as in standard neural network training. In this talk we will present an overview of both ANNs and SVMs and explore their performance in pricing European options. Furthermore, we will show how neural networks can be used to modify some input parameters of an analytical option pricing model so that its pricing performance can greatly be improved.

ES22 Room: GPA ROBUSTNESS WITH HIGH DIMENSIONAL DATA Chair: Stefan Van Aelst

#7: **Fast bootstrap for robust Hotelling tests**

Presenter: Ella Roelant@Ghent University, Belgium
Co-authors: Stefan Van Aelst, Gert Willems

If we want to estimate the location and scatter of a multivariate data set with outliers, the sample mean and sample covariance matrix will no longer be satisfactory as they can be extremely sensitive to outliers. As robust alternatives, we will focus on S-estimators and MM-estimators which are efficient, positive breakdown estimators. Inference for robust estimators is often based on the asymptotic distribution of these estimators. However, as asymptotic estimates may be inaccurate, the bootstrap can be used as an alternative approach. Unfortunately, the standard bootstrap procedure is non-robust and computationally demanding. Both these problems are resolved by the fast and robust bootstrap (FRB) procedure. This method exploits the property that robust estimators such as S- and MM-estimators can be written as the solution of a system of smooth fixed-point equations. We consider a robust version of the one-sample and two-sample Hotelling test by using S- or MM-estimators instead of the empirical mean and covariance matrix. The FRB can then be used to mimic the distribution of the test statistic and critical values can be determined through the quantiles of the recalculated statistics. Simulations show good performance and illustrate that the bootstrap can outperform the asymptotic variance approach.

#11: **Stahel-Donoho estimators with cellwise weights**

Presenter: Gert Willems@Ghent University, Belgium
Co-authors: Ellen Vandervieren, Stefan Van Aelst

The Stahel-Donoho estimator is a well-known affine equivariant robust estimator of multivariate location and scatter. It is defined as a weighted mean and covariance, where each point receives a weight in function of a measure of its *outlyingness*. This measure is based on the one-dimensional projection in which the point is most outlying, the underlying idea of which is that every multivariate outlier must be a univariate outlier in some projection. Points with large outlyingness should then receive small weights. In the sense that the entire point is either downweighted or not, all components of the point are treated in the same way irrespective of their *responsibility* for the outlyingness. Here we investigate an adaptation of the Stahel-Donoho estimator where we allow separate weights for each component. The idea is to start from the outlyingness of the point as measured in the original Stahel-Donoho procedure. Subsequently, for each point, we attempt to identify to what extent each variable is contributing to the outlyingness and we use this information to adjust the outlyingness and corresponding weight in a componentwise manner. By adapting the estimator in this way, we are giving up affine equivariance but we may gain efficiency.

#6: **Outlyingness weighted quadratic covariation**

Presenter: Kris Boudt@K. U. Leuven, Belgium
Co-authors: Christophe Croux, Sebastien Laurent

Quadratic covariation is a natural estimator for the volatility of a multivariate price process. It is consistently estimated by the sum of outer products of high-frequency returns. The Realized BiPower Covariation (RBPCov) is often used to estimate the quadratic covariation of the continuous component of the price diffusion. This paper introduces the Realized Outlyingness Weighted Quadratic Covariation (ROWQCov) as an alternative to the RBPCov. The new estimator equals a weighted sum of outer products of high-frequency returns and downweights returns that, because of jumps or other reasons, are outliers under the Brownian SemiMartingale (BSM) model. Under this model the ROWQCov is consistent for the integrated covariance matrix. Besides robustness to jumps, the new estimator also enjoys the desirable properties of positive semidefiniteness and affine equivariance. Our Monte Carlo study suggests that, at all sampling frequencies, the new estimator is more efficient than the RBPCov under the BSM model, consistent under the BSM model with jumps in cases where the RBPCov is no longer consistent and its robustness to jumps is preserved under temporal aggregation. We illustrate this new method on 15-minute return series of the EUR/USD and GBP/USD exchange rates.

#64: **On non-parametric robust quantile regression by support vector machines**

Presenter: Andreas Christmann@University of Bayreuth, Germany
Co-authors: Ingo Steinwart

We consider the non-parametric estimation of quantile functions by support vector machines (SVMs) based on the pinball loss

function or on the eps-insensitive loss function. Some results are given which show that SVMs based on these loss functions are robust and can learn the unknown distribution as the sample size converges to infinity if the kernel is bounded. Furthermore, we investigate how fast SVMs can learn by using an oracle inequality.

CS02 Room: B013 INTERNATIONAL FINANCIAL MANAGEMENT Chair: Ana-Maria Fuertes

#4: **Optimal asset allocation under comovements and downside-risk measures**

Presenter: Jose Olmo@City University, London, UK
Co-authors: Jesus Gonzalo

We disentangle in this paper the risk exposure of an investment portfolio due to comovements between its assets from the risk exposure due to the allocation of weights. As a byproduct we show that the efficient portfolio frontier in comovements episodes can be different from the unconditional efficient frontier and propose a bivariate Value at Risk (VaR) that gauges the sensitivity of the risk measure to variations in the level of comovements between the assets. Our second contribution consists on developing nonparametric bootstrap hypothesis tests for testing stochastic dominance between portfolios, stressing the case of stochastic dominance in comovements regimes. This method permits the ordering of portfolios in accordance to the preferences of downside-risk averse investors in different episodes of the market. We also carry out a Monte-Carlo simulation study to assess the consistency and performance of the tests in finite samples. The empirical application shows the differences in the efficient portfolio frontier between crises and non-crises episodes determined by comovements and non-comovements for a portfolio comprised by equity, bonds and currency assets from US and UK financial markets.

#41: **Sovereign rating transitions: finite-sample properties of alternative estimators**

Presenter: Alena Audzeyeva@University of Leeds, UK

This paper assesses the small-sample properties of alternative estimators of sovereign rating transitions, for which only a short history is available. Three expected value estimators with ”expert knowledge”, which are developed within a Bayesian framework using different priors: noninformative, informative and exponential, are compared with the traditional ”cohort” and continuous-time estimators. Estimates of both coarse- and fine-letter rating transition matrices are assessed at various time-horizons using bootstrap simulations. An ”S-measure” is suggested to examine the finite-sample bias of default curves (as opposed to single default probabilities) given by alternative estimators. The analysis shows that the expected value estimates are characterised by the largest off-diagonal probability mass as measured by the matrix mobility metric. The continuous-time estimate and the expected value estimate with the exponential prior have the closest mobility to that of the true rating transition process. For investment grade ratings, the continuous-time approach gives the most efficient estimates of both default probabilities and default curves at all time-horizons. For many non-investment grade ratings, the expected value estimator with the exponential prior performs as well as or better compared to the continuous-time estimator. The estimated fine-letter transition matrices exhibit greater stability and a smaller estimation bias when compared to their coarse-letter counterparts.

#125: **The credit crisis: a regime-change approach to analyzing imbedded markets**

Presenter: Willi Semmler@Long Island University, USA
Co-authors: Lucas Bernard

The advent of securitization products, e.g., mortgage-backed securities (MBS), has brought the issue of default correlation to the center of finance. Unfortunately, this topic is complex and a single computational technique or methodology may not suffice to explain market phenomena which have these structures imbedded in them. Multiple computational methods allow different dimensions of phenomena to be treated in the most appropriate way. In a previous paper, we analyzed the correlation between a firm’s capital assets and their impact on the credit risk of the firm. In that model, we studied the effects of random shocks to diversified capital assets, wherein the shocks were correlated to varying degrees. Thus, we constructed a framework within which the effects of correlated shocks to capital assets could be related to the probability of default for the company. The dynamic decision problem of maximizing the present value of a firm faced with stochastic shocks was solved using numerical techniques. Further, the impact of varying dependency structures on the overall default rate was also explored. In this paper, we extend these results to apply to the recent sub-prime and credit crises. We find that while a dynamic decision approach can describe the stylized facts of these events, it is necessary to resort to a regime-shift approach to explain certain dramatic features of these events. We construct an MBS and use Monte Carlo simulation to obtain fair spreads for each of the tranches. A Cholesky reduction approach to the correlation matrix is used to incorporate market effects such as contagion, default correlation, etc. After calibrating this model to known studies by the mortgage insurance industry, we conduct sensitivity analysis and show that correlation between default rates can accelerate the boom-bust nature of these markets. Further, we show that Federal Reserve policy has only limited efficacy in the control of these processes. We conclude that issues of moral hazard are key to the safe administration of structured products.

#210: **Dependence in the insurance sector and possibilities for international diversification**

Presenter: Oleg Sheremet@Vrije Universiteit, Netherlands
Co-authors: Andre Lucas

We study the possibility for international diversification of catastrophe risk by the insurance sectors in three globally disconnected regions, broadly named as America, Europe, Asia and Australia. Adopting the argument that large insurance losses may be a

'globalizing factor' for the industry, we study the dependence of geographically distant insurance markets via equity returns. In particular, we employ conditional copula theory to model the bivariate dependence of the insurance industry. In contrast to earlier literature on this subject, we try to disentangle the causes of dependence stemming from the asset side and those from the liability side by conditioning insurers' equity returns on general market conditions. As a measure of dependence, we use both correlation and tail dependence coefficients. We find that for both Europe-America and Europe-Asia the dependence is significant. Moreover, we find asymmetric effects: the dependence between negative returns is higher than between positive returns. Further, we investigate the dynamics of the copula parameters and find some mild evidence of a gradually increasing degree of dependence since the mid-1990s. Overall, this implies that over the past ten years the scope for international diversification of large insurance losses has reduced considerably, with the possible exception of America–Asia markets, where most of the dependence between equity returns appears to be due to correlated asset rather than liability portfolios.

#222: **Analysis of multi-objective portfolio models for the Istanbul stock exchange**

Presenter: Yeliz Mert Kantar@Anadolu University, Turkey
Co-authors: Memmedaga Memmedli, Ilhan Usta

Aim of portfolio management is to select portfolio weights so as to minimize risk and maximize return. Markowitz' mean-variance model (MVM) has been accepted as a pioneer model in the modern portfolio theory. However, MVM has various disadvantages due to non-normality of return rate in general cases, computation costs and concentration of few assets. Therefore, up to now a large number of studies have been published concerning the use of new models to avoid these possible disadvantages. For example, the mean absolute derivation (MAD) as a risk measure and the entropy model (EM) as the objective function are given. In this study, Shannon's entropy measure as a criterion in investment decision is analysed in order to decide appropriate portfolio weights obtained from different types of model using data taken from the Istanbul Stock Exchange (ISE 30 index). Moreover, the usage of entropy as an objective function is discussed. Numerical experimentations are conducted to compare the performance of these models in terms of entropy measure. As a result of experimentations, appropriate models are determined for the portfolio selection.

CS09 Room: AUM NON-LINEAR ESTIMATION, MULTIVARIATE AND STRUCTURAL MODELS Chair: Lynda Khalaf

#73: **Likelihood based estimation for multivariate time series processes**

Presenter: Artem Prokhorov@Concordia University, Canada

The paper considers conditional MLE of multivariate time series models as a GMM problem. The copula representation allows to separate univariate distributions from the (conditional) copula distribution. This allows to arrive at an improved conditional Quasi MLE of univariate distribution parameters (inference for the margins) and an improved conditional Pseudo MLE of both the univariate distribution parameters and the copula dependence parameter. We use the GMM toolbox to study efficiency of the likelihood based estimators of the parameters in the marginal and the copula. We point out to several alternatives of using copulas to construct joint likelihood in the time series setting. They include using multivariate Archimedean copulas and the copula-based characterization of Markov processes using bivariate copulas. As an application we estimate the tail dependence parameters of an European and an American stock exchange index.

#100: **Persistence-robust causality testing**

Presenter: Alex Maynard@University of Guelph, Canada
Co-authors: Dietmar Bauer

The persistent behavior commonly observed in economic time series may arise from a variety of models including those with unit roots, near unit roots, long-memory models, and/or structural breaks. Although such alternatives are not always distinguished with confidence in practice, common inference procedures in predictability and Granger causality testing often rely heavily on the choice of model. Previous papers have introduced tests in I(1) VAR models based on an additional lag in the specification of the estimated equation which is not included in the tests. This approach, which we refer to as the surplus lag method, leads to conventional test distributions for stationary and (co)integrated data generating processes. By extending the surplus lag methodology to the VARX framework, we show that it can provide Granger causality tests that accommodate stationary, nonstationary, near-nonstationary, long-memory, and unmodelled structural break processes within the context of a single Chi-squared null limiting distribution. Since the distribution under the null hypothesis is the same in all cases, no prior knowledge, first-stage testing, or estimation is required.

#166: **Edgeworth expansions for nonlinear estimators**

Presenter: Gubhinder Kundhi@Carleton University, Canada
Co-authors: Paul Rilstone

Edgeworth Expansions for Nonlinear Estimators are derived. The results are shown to apply to most of the common extremum estimators used in applied work including Generalized Method of Moments, Maximum Likelihood Estimators and Generalized Empirical Likelihood Estimators in an i.i.d sampling context. Examples of the applicability of the method are provided for a number of popular Nonlinear estimators. It is well known that generalizing Edgeworth expansions for sums of i.i.d. univariate random variables to multivariate cases can be complicated. Therefore, a new and simpler method is developed using a linear transformation of a vector of parameters. This is done for cases where the asymptotic variance of the estimators is known and

unknown. The viability of the results are shown using a Monte Carlo experiment conducted for the Exponential regression model. In this experiment the performance of the Edgeworth Expansion for the Maximum Likelihood Estimator is compared with other methods commonly used in finite sample inferences such as the Bootstrap.

#193: **A method to estimate the preference structure of joint financial forecast decisions**

Presenter: Ba Chu@Carleton University, Canada
Co-authors: George Christodoulakis

Given a sequence of observed forecast errors, Elliott, Komunjer and Timmermann proposed a univariate method to estimate the preference asymmetry parameter of a loss function and an associated forecast rationality test. In this paper, motivated by the fact that many forecast decisions are made jointly rather than individually (e.g., forecast errors may be correlated), we develop a multivariate extension and provide an estimator for a vector of loss preference parameters and a test for joint forecast rationality.

#24: **Examining the role of real wage rigidities for Canadian inflation**

Presenter: Maral Kichian@Bank of Canada, Canada
Co-authors: Jean-Marie Dufour, Lynda Khalaf

In this paper we evaluate empirically the extent to which real wage rigidities matter for inflation in Canada. The analysis is conducted using two recently-proposed New Keynesian Phillips Curve (NKPC) models that obtain from alternative theoretical assumptions regarding the labour market and real wage rigidities. In all cases, structural estimations and tests are carried out using identification-robust methods that are valid irrespective of the identification status of the considered model. We provide, in particular, structural estimates of the Calvo parameter and of the real wage rigidity index. Our results show that one of the models has more overall empirical support than the competing model, and that the unemployment rate, productivity, as well as real wage rigidity, all play a role in shaping inflation. In particular, we find that the importance of sluggishness in real wages, as captured by the estimate for the real wage rigidity index, is relatively modest, at a value of 0.10. As for price stickiness, we find that estimates of the Calvo parameter indicate average price durations of approximately two quarters in Canada. Finally, we find that considerable uncertainty is associated with parameter estimates. Indeed our methods show that this uncertainty is generally much larger than would be implied by methods that are non-identification-robust.

CS12 Room: E003 INTEGER VALUED TIME SERIES AND RELATED TOPICS - 1 Chair: Konstantinos Fokianos

#138: **Count time series with overdispersed data**

Presenter: Robert Jung@Universitaet Erfurt, Germany
Co-authors: A.R. Tremayne

There has recently been an upsurge of interest in time series models for count data. Many papers focus on the model with first order (Markov) dependence. This paper considers practical models that capture higher order dependence. There are various ways of achieving this. One approach, which has a number of attractions and has so far not been used in applied work will be pursued further here. We also provide a unifying framework for explicitly dealing with the extra binomial variation regularly found in empirical applications. This is achieved by means of generalized Poisson model innovations, rather than some nonparametric approach which might also be feasible. Based on the conditional probability mass functions of survivors from random operations, conditional on past observed values, and their convolutions with innovation distributions we show how to develop maximum likelihood estimators for the parameters of models of interest. Estimated asymptotic standard errors are readily produced to facilitate inference. Finally, we propose novel methods for assessing model adequacy based on a parametric bootstrap procedure. All methods are applied to three new sets of time series data of a stock variety that have not hitherto been used in the literature.

#101: **Efficient estimation of semiparametric integer-valued autoregressive models**

Presenter: Feike C. Drost@CentER, Tilburg University, Netherlands
Co-authors: Ramon van den Akker, Bas J.M. Werker

Integer-valued autoregressive (INAR) processes have been introduced to model nonnegative integer-valued phenomena that evolve over time. The distribution of an INAR process is essentially described by two parameters: a vector of autoregression coefficients and a probability distribution on the nonnegative integers, called an immigration or innovation distribution. Traditionally, parametric models are considered where the innovation distribution is assumed to belong to a parametric family. This paper instead considers a more realistic semiparametric INAR model: essentially there are no restrictions on the innovation distribution. We provide an (semiparametrically) efficient estimator of both the autoregression parameters and the innovation distribution.

#36: **Specification of landmarks and forecasting water temperature**

Presenter: Goeran Kauermann@University Bielefeld, Germany

We present and analyse a data set about water and air temperatures in and along the river Wupper in the northern part of Germany. The analysis pursues two concrete aspects. First, it is of interest to find so called landmarks, these are regularly occuring timepoints at which the temperature follows a particular pattern. These landmarks will be used to assess whether the current year is running ahead or behind the average seasonal course of a year. Secondly, we focus on forecasting water temperature using smooth principal components. The latter approach is also used for bootstrapping temperature data, which allows to assess the variability of the specified landmarks. The implications of our modelling exercise are purely economic. The data trace from a larger project aims

to develop a temperature managment tool for two power plant stations along the river Wupper. These stations use river water for cooling purposes and to preserve natural wild life in the river there is a strict limit of the maximal temperature of the water. The latter constrains the possible production range of the power plant. More accurate forecasts therefore mean a higher potential for energy production.

#208: **Poisson autoregression Integer valued GARCH**

Presenter: ..... Anders Rahbek@Copenhagen, Denmark
Co-authors: ..... Konstantinos Fokianos, Dag Tjostheim

This paper considers geometric ergodicity and likelihood based inference for Poisson autoregressions. In the linear case the conditional mean is linked linearly to its past values as well as the response. This also applies to the conditional variance, implying an interpretation as an integer valued GARCH process. In a nonlinear conditional Poisson model, the conditional mean is a nonlinear function of its past values and a nonlinear function of past responses. As a particular example an exponential autoregressive Poisson model for time series is suggested. Under the assumption of geometric ergodicity the parameters are shown to be asymptotically Gaussian in the linear model. In addition we provide a consistent estimator of the asymptotic covariance, which is used in the included simulations and analysis of transaction data. Our approach to verifying geometric ergodicity proceeds via Markov theory and irreducibility. Finding transparent conditions for proving ergodicity turns out to be a delicate problem in the original model formulation. This problem disappears if an arbitrary small, but fixed, perturbation of the model is allowed. We study the estimators, and the asymptotics, based on the perturbed linear model as well. We argue that as the perturbations can be chosen to be arbitrarily small, the differences between the perturbed and non-perturbed versions are not detectable for practical purposes.

#228: **The new models for skew and kurtotic data via maximum entropy distributions based on specified moment functions**

Presenter: ..... Ilhan Usta@Anadolu University, Turkey
Co-authors: ..... Aladdin Shamilov, Yeliz Mert Kantar

Kurtosis and asymmetry are stylized facts of economic and financial data. To date there have been wide studies concerning various skewed and kurtosis distributions which model these types of data. These distributions may be satisfactory in many cases however in general, they are not enough to account for the kurtosis and asymmetry in the data. It is well known that the Maximum entropy (MaxEnt) distributions based on moment functions not only have a powerful and flexible functional form but also cover most of statistical distributions. Taking into account these properties of MaxEnt distributions, in this study, we propose the MaxEnt distributions based on the selected special moment function so as to model skewed and kurtosis data accurately. We also conduct a Monte-Carlo simulation to exhibit the performance of the MaxEnt distributions with the selected special moment functions over distributions used in literature, such as skewed t, g and h, generalized beta of the second kind (GB2), Pearson type IV and suchlike, in terms of modeling kurtosis and skewed data.

CS14 Room: B103 FINANCIAL RISK MANAGEMENT Chair: Cathy W.S. Chen

#35: **Value-at-Risk estimation using flexible ICA-GARCH models**

Presenter: ..... Philip Yu@The University of Hong Kong, Hong Kong
Co-authors: ..... Edmond Wu, W.K. Li

Volatility modeling of asset returns is an important aspect for many financial applications, e.g., option pricing and risk management. The generalized autoregressive conditional heteroscedasticity (GARCH) model and its variants such as EGARCH, GJR-GARCH, and threshold GARCH models have become popular standard tools to model the volatility processes of financial time series. Although univariate GARCH models are successful in modeling volatilities of financial time series, the problem of modeling multivariate time series has still been challenging. Recently, we suggested using independent component analysis (ICA) to decompose multivariate time series into statistically independent time series components and then separately modeled the independent components by univariate GARCH models. In this talk, we extend this class of ICA-GARCH models to allow more flexible univariate GARCH-type models. Finally, we will apply the proposed models to compute value at risk for several major international stock market indices.

#34: **Bayesian forecasting for financial risk management**

Presenter: ..... Cathy W.S. Chen@Feng Chia University, Taiwan
Co-authors: ..... Wayne Lee

Value at Risk has become a standard approach for measuring and forecasting the downside market risk of an asset portfolio. We consider a computational Bayesian framework for fully parametric forecasting of Value-at-Risk thresholds from a range of competing heteroskedastic models in an empirical forecasting study. We employ a range of modern, popular parametric financial econometric models, each considered in conjunction with three well-known probability distributions, for the underlying error component. The models include symmetric, threshold nonlinear and Markov switching GARCH model specifications. The error distributions considered are the Gaussian, Student-t and the generalized error distribution. Adaptive and efficient Bayesian Markov chain Monte Carlo sampling methods are designed for in-sample estimation and to construct Bayesian estimators of the general k-period forecast VaR, via the quantiles of the predictive asset return distribution implied by each model. For the empirical study, an asset portfolio of four major Asia-Pacific Economic Cooperation (APEC) stock markets is considered. To compare the competing VaR model forecasts, the violation rate, the absolute deviation given violation and the market risk charge are calculated

for the portfolio return series, for each combination of model and error distribution. The empirical results reveal that heavy-tailed exponential GARCH models are marginally favoured for forecasting Value at Risk for this data.

#192: **Combination of conditional covariance matrix forecasts**

Presenter: Alessandra Amendola@University of Salerno, Italy
Co-authors: Giuseppe Storti

The generation of accurate volatility forecasts is required in many financial applications such as risk measurement or portfolio optimization. A wide range of methods and models are available and the use of different approaches can often lead to remarkably different volatility predictions. It follows that model uncertainty is a relevant problem which cannot be ignored by risk managers and any other practitioners making use of volatility forecasts. In a previous paper the authors have proposed a GMM approach to the combination of univariate volatility forecasts. Aim of this paper is to extend their approach to combination of multivariate volatility forecasts. This is not straightforward due to the curse of dimensionality typically affecting multivariate conditional heteroskedasticity models. In a multivariate setting, the number of moment conditions to be imposed rapidly tends to explode with the model's dimension. So the size of the problem becomes unmanageable even for relatively moderate sample sizes. The approach we follow in this paper is to disaggregate the full portfolio of assets into subsets of smaller dimensions. The combination weights assigned to each candidate model can then be estimated by means of a strategy in the spirit of the MacGyver method recently proposed by Engle for the estimation of high dimension Dynamic Conditional Correlation models.

#91: **Dependence measures for risk management**

Presenter: Wing Han Iris Yip@HKUST, Hong Kong
Co-authors: Mike K. P. So

In risk management, reducing the risk of a portfolio is a main concern. There are many findings on the extreme events which may cause a huge loss on the portfolio. In this paper, we focus on how the extreme value events are related by using different measures: Simple correlation, multiple correlation, canonical correlation, rank correlation, Kendall's tau and tail dependence. From this analysis, we can reduce the number of pairs of correlations to analyze and suggest a portfolio with stable risk on a given expected return.

#246: **Computational aspects of nested Monte Carlo simulations for risk management purposes**

Presenter: Gerhard Stahl@Talanx AG, Germany
Co-authors: Hans-Joachim Zwiesler, Dr. Andreas Reuss, Daniela Bergmann

Within the EU, risk-based funding requirements for insurance companies are being revised as part of the Solvency II project. One key aspect of the new regulatory framework is to determine the required risk capital for a one-year based on market consistent valuation of assets and liabilities. This approach results in non-standard, yet unsolved numerical and computational problems. A strategy is to use a stochastic model for the insurance company to project all assets and liabilities over one year via Monte Carlo simulations. In particular, such a stochastic model captures the impact of financial market variables on the assets. The computation of the surplus in one year's time requires market consistent valuation of the (then) existing portfolio of assets and liabilities. Due to the complex financial structures this valuation cannot be performed in closed form but requires Monte Carlo simulations. Since these market consistent valuations are embedded in a stochastic model for the real-world development of the company over one year, we are facing the problem of *nested simulations* (i.e. simulations within simulations). The paper suggests a three-step process to replace the computationally unfeasible nested simulations by an approximation that is both computationally manageable and sufficiently accurate.

CS15 Room: B104 RISK MANAGEMENT Chair: Zhengjun Zhang

#40: **Tail and non-tail memory with applications to GARCH processes**

Presenter: Jonathan Hill@University of North Carolina, USA

New notions of tail and non-tail dependence are used to characterize the extremal and non-extremal memory properties of GARCH(p,q) processes, including IGARCH and explosive GARCH. Whereas IGARCH processes are known not to be Near-Epoch-Dependent, their extreme events and log-exceedances, and tail-trimmed levels are Near-Epoch-Dependent. The theory implies highly robust estimation of extreme value statistics, or population statistics in the presence of extremes, including "extremal regression" and tail-trimmed GMM. We apply the theory to prove asymptotic normality for a non-parametric tail dependence estimator, and a tail-trimmed sum for non-covariance stationary GARCH data.

#239: **Equity volatility and the business cycle: a factor model approach**

Presenter: Giuliano De Rossi@UBS, UK

Recent econometric research has sought to model equity volatility as a combination of macroeconomic effects and time series dynamics. The model is characterised by a multiplicative decomposition in which the unconditional volatility, which captures low frequency changes, is deterministic while the high frequency component follows a GARCH process. This paper develops an alternative nonparametric approach based on cubic spline models. Well known results on Gaussian state space forms can be used to establish a connection between the approach discussed here and factor stochastic volatility models. The proposed methodology has several advantages: i) it does not require selection of the optimal number of knot points ii) it can easily accommodate missing

and irregularly spaced observations iii) it lends itself naturally to multivariate generalisations. An application to global equity indices is also discussed. One of the goals is to identify a common long term trend in global equity volatility and pin down its main macroeconomic drivers. The model can be used to generate long horizon forecasts of volatility that depend on macroeconomic scenarios.

#195: **Quantile approximation in small models for integrated risk management**

Presenter: Thomas Wenger@Passau University, Germany

From a quantitative perspective, integrated financial risk management requires the evaluation of quantiles of loss distributions obtained at a portfolio level from dependent loss variables at some finer level of resolution. The portfolio may consist of business units, individual financial instruments or pre-aggregated types of risk such as market risk or credit risk. In each case, there is a need in evaluating the quantiles of the sum of a set of dependent random variables with heterogeneous distributions, and far from jointly normal. Monte Carlo simulation allows the estimation of the wanted quantile of total loss after specifying the dependence structure as a multivariate distribution or by means of a copula. We propose approximate and semi-analytical methods that enhance the transparency and structure of the simulation, while remaining faithful to the departure from the world of multivariate normality of the joint losses. Due to the small number of random factors, quasi-Monte Carlo simulation performs well. The Cornish-Fisher expansion of the quantile is employed based on the simulation of moments technique. In the case of a Gaussian factor structure, higher moments are approximated by Wick's formula. The saddlepoint method for the Vasicek single factor model of credit risk is embedded into a context of integrated risk.

#148: **The general moments expansion: an application for financial risk**

Presenter: Trino-Manuel Niguez@University of Westminster, UK
Co-authors: Javier Perote

This paper presents a family of distributions based on what we name General Moments Expansions (GME). We show that the GME preserves the flexibility and good performance of the densities based on Edgeworth and Gram-Charlier series for modelling asset returns. Nevertheless the GME is simpler and more general, since it can be straightforwardly applied to expand any distribution with finite moments up to the truncation order. The goodness-of-fit of a GME using the Normal as basis is tested and compared to both the Gaussian and Student's t by means of an empirical application for forecasting financial risk.

#95: **Computing equilibria of a fast-trading electronically brokered security market model**

Presenter: Alexis Derviz@Charles University in Prague, Czech Republic

The paper develops a numerically tractable model of a fast brokered security market, meaning a large number of participants, short-lived motives for trade and uncertain terms of individual trade for any given participant due to a high concentration in time of other participants' actions. These features are typical for electronically brokered trading in many upper-end stocks and bonds and major currencies. Informational opacity of fast markets stems from terms-of-trade uncertainty. The order book changes many times before an order is submitted. A limit order (LO) submitter does not know for sure with what orders he will compete for execution, whereas a market order (MO) submitter may be unable to hit the observed best quote because others might attain service priority by pure luck if registered a split-second earlier. The subjective uncertainties of an investor who cannot keep up with changing market conditions are formally embodied in two risks: execution uncertainty for LO and random transaction price assignment for MO. We analyze a static round of trading, therewith approximating the temporal uncertainty of the physical fast market reality by the spatial uncertainty of the model. We first prove equilibrium existence and then develop a numerical solution algorithm applicable to any selected parametric form of the private value and belief distribution. Specifically, we calculate the map of informational parameters of the investor population into orders, trades and the publicly observed central price. The deviation of the mean common prior belief about the true parameters of the private value distribution from the true parameter value is interpreted as market sentiment. Comparative statics results of the computed equilibria suggest that this sentiment has a stronger impact on, inter alia, volume and net direction of trades leading to a given central price, than the actual distribution of private values.

CS31 Room: ALG INFERENCE IN TIME SERIES AND ECONOMETRICS Chair: Alessandra Luati

#184: **Changes in regime and cointegration analysis**

Presenter: Margherita Gerolimetto@Ca' Foscari University of Venice, Italy
Co-authors: Luisa Bisaglia, Isabella Procidano

In this work we study a cointegration model where the equilibrium error switches between two regimes: one stationary and one with unit root. Firstly we consider the seminal threshold cointegration model then we generalize this scheme by considering the hypothesis that the discontinuous adjustment to a long-run equilibrium may occur following Markov switching and STOPBREAK models. Our aim is to show how often these particular kinds of cointegration models can be confused with the fractional cointegration model, where the equilibrium error is long memory instead. Recently it has been shown that inference on the long memory parameter and persistence tests are severely compromised in series which display regime switching effects, since their autocorrelation decays very slowly. In particular, if the equilibrium error of a cointegration model switches between two regimes it may be confused with a long memory process, leading the researcher to confuse threshold cointegration with (spurious) fractional cointegration. To highlight how often and to which extent threshold cointegration can be confused with fractional cointegration we conduct a Monte Carlo experiment, where the long memory parameter, d, is estimated with the GPH method and Whittle method

on the residuals of various threshold cointegration models.

#225: **Computing weighted chi-square distributions and related quantities**

Presenter: Raffaello Seri@Universita dell'Insubria, Italy
Co-authors: Christine Choirat

Under general conditions, the asymptotic distribution of degenerate 2-nd order U- and V-statistics is an (infinite) weighted sum of chi-square random variables whose weights are the eigenvalues of an integral operator associated with the kernel of the statistic. Also the behavior of the statistic in terms of power can be characterized in terms of eigenvalues and eigenfunctions of the same integral operator. No general algorithm seems to be available in the statistical literature to compute these quantities starting from the kernel of the statistic. We provide such an algorithm: it can be used to approximate (as precisely as needed) the asymptotic distribution and the power of the test statistics, and to build several measures of performance for tests based on U- and V-statistics. The algorithm uses the Wielandt-Nystroem method of approximation of an integral operator based on quadrature, and can be used with several methods of numerical integration. An extensive numerical study shows that the Wielandt-Nystroem method based on Clenshaw-Curtis quadrature performs very well both for the eigenvalues and the eigenfunctions.

#158: **From short to long memory: aggregation and estimation**

Presenter: Jan Beran@University of Konstanz, Germany
Co-authors: Sucharita Ghosh, Martin Schutzner

Several studies have shown that long memory, in the sense of slowly decaying non-summable autocorrelations (or a fractional differencing parameter d¿0), can be found in many financial time series. In particular, persistence is frequent in volatility series. In the case of macroeconomic time series, Granger (1980) suggested that long memory may be due to the definition of the series, since contemporaneous aggregation of heterogeneous AR(1) processes can lead to $d > 0$. Generalizations of this result include aggregation of general stationary and integrated processes with short memory, as well as aggregation of volatilty models. In this paper, we consider estimation of d when the individual series used in the aggregation are available. Asymptotic properties of maximum likelihood estimation and related procedures based on the panel data are considered, as the number of series and their length tend to infinity. The results are compared with ML estimation for the aggregated series. The panel based method is particularly promising in the context of long-memory volatility models, since there, all currently available methods have a slow rate of convergence. The methods have wide applications, including climate and environmental research, where data series from various locations may be averaged to derive overall trends.

#214: **Likelihood-based recursive tests of the adaptive learning hypothesis**

Presenter: Luca Fanelli@University of Bologna, Italy

We propose likelihood-based recursive tests for the cross-equation restrictions that the class of forward-looking models typically used in monetary policy imposes on vector autoregressive (VAR) systems, under the adaptive learning hypothesis. As the information set increases over time and estimates are updated recursively, the test for the adaptive learning hypothesis amounts to a sequence of likelihood ratio (LR) statistics obtained by comparing the likelihoods of the unrestricted and constrained VAR. We show through simulation experiments that, in order to control the null hypothesis over the entire sequence, a proper set of critical values can be opportunely adapted from the theory recently proposed by Inoue and Rossi (2005), also obtaining satisfactory power against backward-looking alternatives, in finite samples. The proposed method is applied to investigate the New Keynesian Phillips Curve (NKPC) on euro area data. The results show that, while the NKPC is sharply rejected under the rational expectations hypothesis, the nonlinear restrictions implied by the model tend to be supported over large parts of the monitoring period when the LR tests are recursively calculated under the adaptive learning hypothesis.

#162: **On the equivalence between the weighted least squares and the generalised least squares estimators, with applications to kernel smoothing**

Presenter: Alessandra Luati@University of Bologna, Italy
Co-authors: Tommaso Proietti

The paper establishes the conditions under which the generalised least squares estimator of the regression parameters is equivalent to the weighted least squares estimator. The results are relevant to kernel smoothing. In particular, they enable to derive the optimal kernel associated with a particular covariance structure of the measurement error, where optimality is to be intended in the Gauss-Markov sense. For local polynomial regression it is shown that the Epanechnikov kernel is the optimal kernel when the errors follow a non-invertible first order moving average process. The generalisation of the results to higher order moving average models produce the Henderson kernel and higher order polynomial kernels.

CS36 Room: B217 TIME SERIES FORECASTING Chair: Marc Wildi

#176: **A nonlinear neural network approach to simultaneous prediction of non-constant mean and volatility for long-tailed distribution**

Presenter: Porntip Dechpichai@University of Wollongong, Australia
Co-authors: Pamela Davy

Most researchers in financial time series using linear or nonlinear models assume that the error term follows a Normal distribution.

However, numerous studies in behaviour of financial data substantially show that the distribution of errors has thicker tails than the Normal. Therefore, it is of interest to exploit the t-distribution instead of Normal distribution in a Neural Network approach. The least square objective function used in conventional Neural Networks can be replaced by the negative log conditional likelihood of target variable given the input variables. This paper considers a likelihood based on a re-scaled t-distribution with constant but unknown degrees of freedom. The re-scaling enables the prediction of both mean and variance at each time point, in contrast to conventional neural networks, which implicitly predict only the expected value on mean. The t-distribution encompasses different types of tail behaviour, approaching the Gaussian case as the degrees of freedom parameter becomes large. Although both the mean and variance are allowed to vary with time, the degrees of freedom parameter is assumed to remain fixed throughout the training and testing periods. This means that a single extra parameter needs to be fitted in addition to the weight parameters with the neural network. The technique is illustrated for the financial time series, such as the stock index of developed and developing markets.

#10: **Forecasting international stock market returns**

Presenter: ..... Marco Willner@Goethe University Frankfurt, Germany

We take up the challenge of forecasting out-of-sample monthly returns on stock market indices. Recent contributions show that a wide range of popular predictors poorly forecast the US equity premium. We revisit these findings with the focus on three aspects. First, we report results for four major stock markets: US, UK, Germany and Japan. We find across countries mixed ability of forecasting the equity premium. Second, this paper focuses on the choice of models and, to a lesser extent, on the choice of predictors. This reflects the changing focus that can be found in recent years. While much of the earlier literature proposed new predictors, several recent articles discuss the structure of the model rather than the choice of variables. In this paper we explore two structural aspects that have attracted attention in the literature: structural changes and theory-induced restrictions. We show that certain structural specifications actually do add forecasting power. Finally, we evaluate the forecasting performance in terms of both the size of the forecasting error and the quality of sign predictions. One of the key findings of the paper is that the results look more favorable for forecasting models when it comes to forecasting the direction of market movements.

#244: **A multivariate generalized hyperbolic stochastic volatility model and the use of realized covariances**

Presenter: ..... Stefan Mittnik@University of Munich, Germany
Co-authors: ..... Christian Pigorsch, Uta Pigorsch

The paper presents a method for modeling the joint dynamics of multiple asset returns by exploiting the information inherent in the realized covariance matrix. While the commonly used realized (co)variance models treat the (co)variance as being observed, i.e., it is not latent anymore, we explicitly account for the fact that once market microstructure effects have been eliminated, the realized covariance is certainly an unbiased but importantly a noisy measure of the quadratic variation of the price process. To this end we propose a multivariate generalized hyperbolic stochastic volatility model, in which the mean of the latent variance depends on lags of the realized covariance measure. Moreover, in contrast to the majority of the existing multivariate stochastic volatility models, we introduce dynamic conditional correlations by directly modeling the full covariance matrix.

#71: **Winner of the NN3-forecasting competition: an application of customized optimization criteria in forecasting**

Presenter: ..... Marc Wildi@idp/zhaw, Switzerland

Traditional forecasting methods typically rely on one-step ahead performances in order to identify models, to estimate parameters and/or to verify model assumptions. We here propose a general approach whose estimation criterion has been modified in order to account for practically relevant model-misspecifications. More precisely, we emphasize out-of-sample multi-step ahead forecasting performances within a 'robustified' framework and allow for forecast combinations across models optimized for various horizons. This approach performed particularly well in the context of the NN3-forecasting competition (see http://www.neural-forecasting-competition.com/NN3/results.htm). To conclude, we would like to present the latest developments about a *self-healing* estimation criterion which generalizes traditional maximum likelihood approaches (common work with the Census Bureau, Washington).

Friday 20.06.2008 09:00-11:00 Parallel Session E

ES08 Room: GPA STATISTICAL SOFTWARE Chair: Petko Yanev

#20: **Visualizing exploratory factor analysis models**

Presenter: Sigbert Klinke@Humboldt-Universitat zu Berlin, Germany
Co-authors: Cornelia Wagner

Exploratory factor analysis is an important tool in data analysis, particularly in social sciences. Our tools visualise various models in parallel with different numbers of factors. The correlation plot shows the correlation between the variables in a scatterplot. A greyscale colour model (white = no correlation, black= large absolute correlation) is used. The variables are ordered in such a way that highly correlated variables are closer together. The communality plot shows the increase of the communalities for each variable if we increase the dimensionality of the model. *General* factors can be seen easily and appear if the factor model chosen is too high-dimensionally. For example, if the concepts behind the questions in a questionnaire are too refined. The variables are ordered in such a way that the variables with similar communality increase are closer together. The factor model plot visualises in scatterplots which variables belong to a factor for different factor models. Colours represent different loadings and we search for *stable* factors in all models. The variables are ordered in such a way that the variables which belong to the same factor are near to each other. We will demonstrate with a R program our tools on several questionnaire data.

#105: **Getting the most out of your CPUs: parallel computing strategies in R**

Presenter: Stefan Theussl@Wirtschaftsuniversitaet Wien, Austria

Facing challenging statistical problems one has to consider to take advantage of parallel computing. With the availability of multicore architectures even in commodity computers there is an increased demand for practical strategies for utilizing these architectures. Generally there are two different types of architectures: shared memory systems and distributed memory systems. Each of which has its advantages and disadvantages which have to be considered when creating parallel applications. In this talk we present strategies for parallelizing programs using different packages available in R. On the basis of an example in numerical algebra we illustrate how both hardware architectures can be used to achieve higher performance: For distributed memory systems such as clusters of workstations we show how MPI can be used to explicitly parallelize a program. For shared memory systems OpenMP can improve the performance of a sequential program by implicit (compiler-driven) parallelization. Finally, we present results of a benchmark experiment comparing the presented parallel routines with their sequential counterpart.

#65: **Tracy-Widom and Painleve II: computational aspects and realisation in S-Plus**

Presenter: Andrei Bejan@Heriot-Watt University, UK

Realisation of the Tracy-Widom distributions of the orders 1, 2, and 4 in textitS-Plus is presented. These distributions appear as asymptotic laws in the spectral theory of random matrices and have comparatively short history. They are of great interest both in theory and applications and prove to be important in modern statistical work. As the distributions are stated in terms of Painleve II transcendent, their realisation requires a special approach of implementation. Performance and stability issues are also discussed.

ES09 Room: B104 STATISTICS FOR DEPENDENT DATA AND ECONOMETRIC MODELS Chair: Jean-Michel Zakoian

#25: **Inconsistency of the QMLE and asymptotic normality of the weighted LSE for a class of conditionally heteroscedastic models**

Presenter: Christian Francq@University Lille 3, France
Co-authors: Jean-Michel Zakoian

This paper considers a class of finite-order autoregressive linear ARCH models. The model captures the leverage effect, allows the volatility to be zero and to reach its minimum for non-zero innovations, and is appropriate for long-memory modeling when infinite orders are allowed. It is shown that the quasi-maximum likelihood estimator is, in general, inconsistent. To solve this problem, we propose a self-weighted least-squares estimator and show that this estimator is asymptotically normal. Furthermore, a score test for conditional homoscedasticity and diagnostic portmanteau tests are developed. The latter have an asymptotic distribution which is far from the standard chi-square. Simulation experiments are carried out to assess the performance of the proposed estimator.

#28: **PAC-Bayesian bounds and model selection**

Presenter: Pierre Alquier@Universite Paris 7 (& Crest), France

The aim of this paper is to generalize the PAC-Bayesian theorems in the classification setting to more general problems of statistical inference with i.i.d. data. We will pay a particular attention to the case of regression estimation with quadratic loss (parametric, or not). We show how to control the deviations of the risk of randomized estimators. A particular attention is paid to randomized estimators drawn in a small neighborhood of classical estimators (defined for example as the minimizers of an empirical risk function), whose study leads to control the risk of the latter. These results allow to bound the risk of very general estimation procedures, as well as to perform model selection. Finally, we discuss the generalization of the previous results to a non i.i.d. setting: under suitable assumptions, we can build a procedure to perform time series model selection.

#31: **Autocorrelation based tests for vector error correction models with uncorrelated but non independent errors**

Presenter: Hamdi Raissi@University Lille 3, France

We consider in this paper the estimation and test-of-fit for vector error correction models with non independent innovations. The asymptotic properties of the residual sample autocorrelations are derived. It is shown that the asymptotic distribution can be quite different for models with iid innovations and models in which the innovations are non independent. Consequently, the usual chi-square distribution does not provide an adequate approximation of the distribution of the Box-Pierce goodness-of-fit portmanteau statistic in the presence of non independent innovations. We thus propose a modified portmanteau test whose asymptotic distribution is a weighted sum of independent chi-squared random variables. We also propose a modified Lagrange multiplier test. Monte Carlo experiments illustrate the finite sample performance of the different tests.

#32: **Regenerative block empirical likelihood for Markov chains**

Presenter: Hugo Harari-Kermadec@Universite Paris-Dauphine, France

Empirical likelihood is a powerful semi-parametric method leading to estimation, test and confidence intervals. Many extensions of this method have been proposed in recent years. However they essentially focus on an i.i.d. setting. In the case of dependent data, the empirical likelihood method cannot be directly applied on the data but rather on blocks of consecutive data catching the dependence structure. Generalization of empirical likelihood based on the construction of blocks of increasing nonrandom length have been proposed for time series satisfying mixing conditions. Following some recent developments in the bootstrap literature, we propose a generalization for a large class of Markov chains, based on small blocks of various lengths. Our approach makes use of the regenerative structure of Markov chains, which allows to construct blocks which are almost independent.

ES18 Room: GB1 INTELLIGENT DATA ANALYSIS Chair: Christian Borgelt

#56: **Learning from data with soft class labels using mixture models and belief functions**

Presenter: Etienne Come@Universite de Technologie de Compiegne, France
Co-authors: Thierry Denoeux, Latifa Oukhellou, Patrice Aknin

This paper addresses classification problems in which the class membership of training data is only partially known. Each learning sample is assumed to consist in a feature vector x_i and an imprecise and/or uncertain *soft* label m_i defined as a Dempster-Shafer basic belief assignment over the set of classes. This framework thus generalizes many kinds of learning problems including supervised, unsupervised and semi-supervised learning. Here, it is assumed that the feature vectors are generated from a mixture model. Using the General Bayesian Theorem, an extension of Bayes' theorem in the belief function framework, we derive a criterion generalizing the likelihood function. A variant of the EM algorithm dedicated to the optimization of this criterion is proposed, allowing us to compute estimates of model parameters. Experimental results demonstrate the ability of this approach to exploit partial information about class labels.

#72: **Probabilistic noise clustering as M-estimators**

Presenter: Frank Klawonn@University of Applied Sciences BS/WF, Germany

Probabilistic or fuzzy clustering approaches use weights to assign data to clusters. Depending on the parametrisation of the clusters and the distance function used for clustering, various cluster shapes are possible ranging from simple spherical clusters to clusters described by hyperplanes or quadrics. Probabilistic clustering can be viewed as a class of M-estimators known from robust statistics. Although various investigations concerning robustness issues in probabilistic clustering are available, recent developments have not been taken into account. Especially in the context of noise clustering establishing a close connection to robust regression can be established leading to new interesting weighting functions to control the properties of the robust estimator.

#75: **Multi-criteria ant feature selection in intelligent classification**

Presenter: Joao M. C. Sousa@Technical University of Lisbon, Instituto Superior Tecnico, Portugal
Co-authors: Susana Vieira

This paper proposes a multi-criteria ant colony optimization (ACO) algorithm for feature selection using intelligent (neural or fuzzy) classifiers. The proposed algorithm deals with the feature selection problem as a multi–criteria problem with a single objective function. The two criteria considered are the size of the subset of features (features cardinality), and the performance of the classifier, which is build based on the selected features. A pheromone matrix is used for each criterion, and different heuristics for the two criteria are used. In order to study the influence of the parameters and to establish the most suitable values for such parameters, the ANalysis Of the VAriance (ANOVA) statistical method is used. Experiments show the significance of parameters concerning the classification error and the number of features. The performance of the proposed multi-criteria algorithm is compared to the performance of an ant feature selection algorithm based only on one criterion (improving classification performance). The results show the advantage of using the multi-criteria algorithm.

#97: **Accelerating fuzzy clustering**

Presenter: Christian Borgelt@European Center for Soft Computing, Spain

Extensions of earlier work on an approach to accelerate fuzzy clustering by transferring methods that were originally developed to speed up the training process of (artificial) neural networks are presented. The core idea of this approach is to consider the

difference between two consecutive steps of the alternating optimization scheme of fuzzy clustering as providing a gradient. This gradient may be modified in the same way as the gradient of (artificial) neural network back propagation is modified in order to improve the training. Even though these modifications are, in principle, directly applicable, carefully checking and bounding the update steps can improve the performance and can make the procedure more robust. In addition, this talk provides a much more detailed experimental evaluation that is based on cluster comparison measures, which can nicely be used to study the convergence speed.

CS05 Room: B217 MARKOV-SWITCHING MODELS FOR FINANCIAL RETURNS Chair: Alessandra Amendola

#14: **Bayesian estimation of a Markov-switching threshold GJR model**

Presenter: David Ardia@University of Fribourg, Switzerland

A Bayesian estimation of a Markov-switching threshold GJR(1,1) model is proposed. The specification is based on a regime-switching model with parallel asymmetric GJR models where asymmetries are centered at free threshold parameters. The model aims at determining (i) whether structural breaks are present within the GARCH dynamics; (ii) whether GARCH asymmetries (i.e., leverage effects) are present, and if they are different between the regimes; (iii) if the threshold parameters (i.e., locations of bad news) are similar between the regimes. The MCMC estimation scheme allows a fully automatic Bayesian estimation of the model and thus, avoids the difficult task of choosing and tuning a sampling algorithm. The presence of two distinct volatility regimes is shown in an empirical application to SMI log-returns. Moreover, the results indicate no difference between asymmetries and locations of the asymmetry for highly volatile and tranquil periods. The performance of the model is compared to a single-regime specification and document a better fit and an improvement of the forecasting ability for the Markov-switching model.

#106: **Forecasting volatility under fractality, regime-switching, long memory and Student-t innovations**

Presenter: Leonardo Morales-Arias@University of Kiel, Germany
Co-authors: Thomas Lux

In this paper we examine the forecasting performance of volatility models that incorporate features such as long (short) memory, regime-switching and multifractality along with two competing distributional assumptions of the error component, i.e. Normal vs. Student-t. Our precise contribution is twofold. First, we introduce a new model to the family of Markov-switching multifractal models of asset returns (MSM), namely, the Markov-switching multifractal model of asset returns with student-t innovations (MSM-t). This model is an extension of the MSM model with normal innovations and can be estimated via Maximum Likelihood or GMM. We investigate the in-sample as well as the out-of-sample performance of this model via Monte Carlo simulations and compare it vis-a-vis other existing models (MSM, GARCH and GARCH-t). Second, we perform a comprehensive in-sample and out-of-sample cross-sectional analysis of the MSM models (binomial MSM, binomial MSM-t, lognormal MSM, lognormal MSM-t) as well as other competing volatility models (GARCH, GARCH-t, FIGARCH and FIGARCH-t). Our cross-sections consist of all-share equity portfolios, bond indices and portfolios of real estate at the country level. Furthermore, we investigate whether there is an improvement upon singular forecasts when optimally combining forecasts obtained from the different models at hand.

#30: **Modeling international financial returns with a multivariate regime switching copula**

Presenter: Alfonso Valdesogo Robles@CORE-Universite Catholique de Louvain, Belgium

In order to capture observed asymmetric dependence in international financial returns, we construct a multivariate regime-switching model of copulas. We model dependence with one Gaussian and one canonical vine copula regime. Canonical vines are constructed from bivariate conditional copulas and provide a very flexible way of characterizing dependence in multivariate settings. We apply the model to returns from the G5 and Latin American regions, and document two main findings. First, we discover that models with canonical vines generally dominate alternative dependence structures. Second, the choice of copula is important for risk management, because it modifies the Value at Risk (VaR) of international portfolio returns.

#124: **Joint forecasts of Dow Jones stocks under general multivariate loss function**

Presenter: Matei Demetrescu@Goethe University Frankfurt, Germany
Co-authors: Tansel Alp

Univariate asymmetric loss functions have been considered in the forecasting literature. But it is not clear what general conditions multivariate loss functions should fulfill; and there is no simple asymmetric multivariate loss function available, either. Our contributions are as follows. We suggest a flexible class of multivariate loss functions based on suitable combinations of univariate loss functions. To estimate the forecast distributions of daily returns of 30 DJIA stocks, we employ a state-of-the-art multivariate GARCH model. It easily copes with large number of series while allowing for non-ellipticity, fat tails and tail-dependence. Based on Engle's DCC GARCH, the model employs multivariate affine normal inverse Gaussian distributions as conditional probability laws. Thus, the number of parameters to be estimated simultaneously does not depend on the number of series. We check the finite-sample properties of multi-step quasi-ML estimators for our non-Gaussian model. These behave roughly the same as the multi-step estimators for the Gaussian DCC model in sample sizes typically available for most financial time series. We fit our model with daily data from 2002 to 2007 (keeping data from 2008 for out-of-sample analyses), and use a parametric bootstrap procedure to derive point forecasts under a number of different multivariate loss functions. We also find CCC-type models to be inferior in terms of mean forecast loss.

CS22 Room: B103 ASSET PRICE DYNAMICS AND PORTFOLIO CHOICE Chair: Willi Semmler

#150: **Financial accelerator mechanism: evidence for Colombia**

Presenter: Martha Lopez@Banco de la Republica, Colombia
Co-authors: Norberto Rodriguez, Juan Prada

Colombia experienced a deep recession in 1999-2003. Growth slowed by 4.2%, and investment by 34.6%. Was the severity of the recession due to a financial accelerator mechanism? To answer this question, this paper estimates a dynamic stochastic general equilibrium model with credit-market imperfections for the Colombian economy using Bayesian methods. The results show that balance-sheet effects played an important role in explaining recent Colombian recession; the financial accelerator mechanism turns out to be quantitatively significant accounting for about 50% of the total reduction in output after a monetary policy tightening.

#164: **Dynamic consumption and portfolio decisions with time varying asset returns**

Presenter: Willi Semmler@New School, USA
Co-authors: Lars Gruene, Karoline Oehrlein

Recent research in financial economics has studied consumption and portfolio decisions, where investment opportunities change over time. This type of work originates in Merton (1971, 1990) who has used the Bellman equation to solve the consumption as well as asset allocation decisions for one state and two choice variables. Campbell and Viceira (1999, 2002) study consumption and portfolio decisions in various models with time varying expected returns by assuming that new investment opportunities are not only arising from changing interest rates, but also from time varying risk premia. They have approximated such a dynamic decision model under the assumption that the consumption-wealth ratio should not vary too much. In this paper, we study dynamic consumption and portfolio decisions by using dynamic programming which allows to compute, with sufficient accuracy, the decision variables and the consumption-wealth ratio at any point of the state space. The dynamic decision problem is first analytically and numerically solved for a simple model with constant returns. Then we solve a model with dynamic consumption and portfolio decisions when time varying returns are calibrated from the low frequency components of US time series financial data. The implications of the change of investor's risk aversion, the returns and the time horizon are explored. Finally, we solve a stochastic version of the model with mean-reverting returns.

#99: **A two-part fractional regression model for capital structure choices**

Presenter: Joaquim Ramalho@Universidade de Evora, Portugal
Co-authors: Jacinto Silva

In this paper we examine the following two hypotheses which traditional theories of capital structure are relatively silent about: (i) the determinants of financial leverage decisions are different for micro, small, medium and large firms; and (ii) the factors that determine whether or not a firm issues debt are different from those that determine how much debt it issues. Using a binary choice model to explain the probability of a firm raising debt and a fractional regression model to explain the relative amount of debt issued, we find strong support for both hypotheses. Confirming recent empirical evidence, we find also that, although larger firms are more likely to use debt, conditional on having some debt firm size is negatively related to the proportion of debt used by firms.

#197: **Efficient and robust estimation of asset returns via the Maximum Lq-Likelihood method**

Presenter: Davide Ferrari@University of Modena and Reggio Emilia, Italy
Co-authors: Sandra Paterlini, Francesco Pattarin

In traditional mean-variance portfolio selection, asset returns are assumed to be normally distributed. Typically, however, their empirical distribution is leptokurtic and a portion of the data on the tails is discordant with the assumed model. For the first time, we employ the Maximum Lq-Likelihood Estimator (MLqE), a novel estimator based on the minimization of Havrda-Charvat-Tsallis entropy, for computing the mean and the variance to be used in portfolio selection. The MLqE is indexed by a single parameter q, which tunes the trade-off between two apparently contrasting aspects: robustness and efficiency. The MLqE provides a good fit for the bulk of the data by smoothly downweighting observations that are inconsistent with the assumed normal model. The MLqE provides a good fit for the bulk of the data by smoothly downweighting observations that are inconsistent with normality. We also provide several checks of the procedure that we have performed by numerical simulation, along with analytical derivations of MLqE statistical properties. Our findings show that the MLqE outperforms other common robust and non-robust estimators. A fast and easy-to-implement algorithm for computing the MLqE estimates is also supplied. Our application of MLqE to Shiller's monthly time series of historical S&P500 returns shows how it can be useful for the study of the behaviour of financial markets and for investment decision making.

CS24 Room: ALG TIME SERIES AND SIGNAL EXTRACTION Chair: Tommaso Proietti

#105: **Seasonal dynamic factor analysis and bootstrap inference: application to electricity market forecasting**

Presenter: Andres M. Alonso@Universidad Carlos III de Madrid, Spain
Co-authors: Carolina Garcia-Martos, Julio Rodrigez, Maria J. Sanchez

In this work we propose the Seasonal Dynamic Factor Analysis, an extension of the Non-stationary Dynamic Factor Analysis, which permits to face dimensionality reduction in vectors of time series with seasonality and to deal with common factors following a multiplicative seasonal VARIMA model. Besides, a bootstrap procedure is proposed to be able to make inference on

all the parameters involved in the model. The bootstrap scheme developed for forecasting includes uncertainty due to parameter estimation, allowing to enhance the coverage of forecast confidence intervals. A challenging application is provided. The new model proposed and bootstrap scheme are applied to an innovative subject in the Spanish electricity market: the computation of long-term point forecasts and forecasting confidence intervals of electricity prices.

#153: **Technical trading revisited: persistence tests, transaction costs, and false discoveries**

Presenter: Olivier Scaillet@HEC Geneva, Switzerland
Co-authors: Pierre Bajgrowicz

We revisit the apparent historical success of technical trading rules on daily prices of the Dow Jones index. First, we use the False Discovery Rate as a new approach to data snooping. The advantage of the FDR over existing methods is that it is more powerful and not restricted only to the best rule in the sample. Second, we perform persistence tests and conclude that an investor would not have been able to select ex ante the future best-performing rules. Finally, we show that the performance fully disappears once transaction costs are taken into account.

#86: **Mixture vector autoregressive model with parameter constraints**

Presenter: Chun Shan Wong@Chinese University of Hong Kong, Hong Kong
Co-authors: Ho Yin Chin

The univariate mixture autoregressive model is recenlty generalized into the multivariate time series context. The mixture vector autoregressive (MVAR) model is a mixture of K vector autoregressive models. The estimation of MVAR model can be carried out with an iterative EM algorithm. In previous works, the standard errors of estimates are computed via numerical methods which may not be reliable. On the other hand, estimation of the fully-specified MVAR model may lead to poor efficiency due to the large number of parameters. In this paper, the MVAR model with parameter constraints is being investigated and its estimation using the EM algorithm is addressed. An approximated observed information matrix based on missing information principle is also derived. The accuracy of the estimation of the MVAR model with parameter constraints and the approximated standard errors is assessed in some simulation experiments. For model selection, the performance of using BIC is also investigated via simulation experiments. The model is applied to the 1-year and 3-year Treasury Constant Maturity Rate. Our results suggest that about 60% of the time, the two rates move independently, and about 40% of the time, there is a unidirectional relationship from the 3-year rate to 1-year rate.

#116: **Estimation of common factors under cross-sectional and temporal aggregation constraints: nowcasting monthly GDP and its main components**

Presenter: Tommaso Proietti@University of Rome Tor Vergata, Italy

The paper estimates a large-scale mixed-frequency dynamic factor model for the euro area, using monthly series along with Gross Domestic Product (GDP) and its main components, obtained from the quarterly national accounts. The latter define broad measures of real economic activity (such as GDP and its decomposition by expenditure type and by branch of activity) that we are willing to include in the factor model, in order to improve its coverage of the economy and thus the representativeness of the factors. The main problem with their inclusion is not one of model consistency, but rather of data availability and timeliness, as the national accounts series are quarterly and are available with a large publication lag. Our model is a traditional dynamic factor model formulated at the monthly frequency in terms of the stationary representation of the variables, which however becomes nonlinear when the observational constraints are taken into account. These are of two kinds: nonlinear temporal aggregation constraints, due to the fact that the model is formulated in terms of the unobserved monthly logarithmic changes, but we observe only the sum of the monthly levels within a quarter, and nonlinear cross-sectional constraints, since GDP and its main components are linked by the national accounts identities, but the series are expressed in chained volumes. The paper provides an exact treatment of the observational constraints and proposes iterative algorithms for estimating the parameters of the factor model and for signal extraction, thereby producing nowcasts of monthly gross domestic product and its main components, as well as measures of their reliability.

CS26 Room: E003 COMPUTATIONAL AND FINANCIAL ECONOMETRICS WITH R Chair: Christian Kleiber

#179: **Mixed logit estimation with R: the rplogit package**

Presenter: Yves Croissant@Universite Lumiere Lyon 2, France

The multinomial logit (or conditional logit) is a widely used model in econometrics to explain the choice of an alternative among a set of exclusive alternatives since the seminal works of McFadden. It is very easy to implement, but suffers serious drawbacks, especially the ”Independence of Irrelevant Alternative Hypothesis”. The mixed (or random parameter) logit is one of the extensions of this model. Some hypothesis about the distribution of the coefficients are made and the parameters of these distributions are estimated by simulation. Currently, a specific form of the multinomial logit model is implemented in R, with individual-specific variables, with the multinom function in the nnet package. We provide a package called mlogit which enables the estimation of the multinomial logit model with both individual and alternative specific variables. We also provide another package called rplogit which depends on the former and enables the estimation of the random parameter logit model. A large set of distributions is provided (normal, log-normal, censored-normal, uniform, triangular) and the correlation between coefficients may be taken into account.

#198: **Least absolute deviation regression: a lexicographical linear goal programming formulation**

Presenter: Frederick Novomestky@Polytechnic University, USA

Least absolute deviation regression is in the class of robust regression models that, compared to traditional least squares regression, is less sensitive to the effect of outliers in the data. This paper solves the least absolute deviation regression estimation problem using the lexicographical linear goal programming model implemented in the r package goalprog. One of the applications considered is the estimation of robust capm-style least absolute deviation factor models which are compared to the corresponding least-squares models.

#174: **Subs4coint**

Presenter: Pu Chen@Rostock University, Germany
Co-authors: D. Bluschke, V. Bluschke, J. Zeng

In this paper we investigate the possibility of the application of subsampling procedure for testing cointegration relations in multivariate systems. The subsampling technique is applied to overcome the difficulty of nonstandard distribution and nuisance parameters in testing for cointegration rank without an explicitly formulated structural model. This paper has three objectives. The first is to show theoretically that the subsampling testing procedure is consistent and has asymptotically power 1. Our second objective is to demonstrate practically that the subsampling procedure can be applied to determine the cointegration rank in large scale models, where the standard procedures hit already its limit; moreover subsampling procedure achieves (depending on situation) comparable and sometimes significant better results as the standard Johansen test. For empirical relevant cases our simulation studies show that centered subsampling improves decisively the performance of subsampling test procedure and makes it applicable also for cases when the number of independent stochastic trends are very large. Finally, this paper acts as a more detailed manual for a new GNU R package subs4coint which gives an opportunity to test the subsampling procedure and to compare these results with the ones of Johansen's test.

#87: **Fast and accurate asymptotic p values for the Nyblom-Hansen test and related statistics**

Presenter: Christian Kleiber@Universitaet Basel, Switzerland

Many test statistics arising in time series econometrics have non-standard limiting distributions. Leading examples include the KPSS stationarity tests and structural change tests such as the Nyblom-Hansen test. In all these cases, the limiting distributions are given by the distributions of certain quadratic functionals of Brownian motion, and critical values are typically obtained via extensive simulations. At CFE'07, the author suggested a method for the evaluation of the KPSS limiting distributions that exploits alternative representations of these distributions as distributions of quadratic forms in normal random variables. It will be shown that the method also works for the Nyblom-Hansen test for structural change, and also for certain tests arising in heteroskedasticity and autocorrelation robust (HAR) inference.

CS28 Room: AUM SIMULATION BASED BAYESIAN INFERENCE FOR DYNAMIC AND FINANCIAL MODELS Chair: Herman van Dijk

#88: **Dynamic panel probit models for current account reversals and their efficient estimation**

Presenter: Guilherme Moura@Christian-Albrechts-Universitat Kiel, Germany
Co-authors: Guilherme Moura, Jean-Francois Richard

Nonlinear panel data models have been used to analyze discrete macroeconomic events such as currency crises, sudden stops and current account reversals. A salient feature of macroeconomic variables to be captured by such models is their distinct serial dependence. We use probit models with unobserved heterogeneity and serially correlated errors in order to analyze the determinants and the dynamics of current account reversals for a panel of developing and emerging countries. Likelihood evaluation of panel probit models with unobserved heterogeneity and dynamic error components is complicated by the fact that the computation of the choice probabilities requires high dimensional interdependent integration. Thus efficient likelihood estimation of such models typically relies upon Monte Carlo (MC) integration techniques. Various MC procedures have been proposed for the evaluation of such choice probabilities, and the most popular among those is the Geweke-Hajivassiliou-Keane (GHK) procedure. While conceptually simple and easy to program, the GHK relies upon importance sampling densities which ignore critical information relative to the underlying dynamic structure of the model, which can lead to significant numerical inaccuracy. In the present study we use Efficient Importance Sampling (EIS) methodology, which represents a generic high dimensional simulation technique. It is based on simple Least Squares optimizations designed to maximize the numerical accuracy of the integral approximations associated with the likelihood. In particular, combining EIS with GHK substantially improves the numerical efficiency of the standard GHK allowing for reliable ML estimation of dynamic panel probit models even in applications with a very large time dimension. The empirical results suggest that countries with high current account imbalances, low foreign reserves, a small fraction of concessional debt, and unfavorable terms of trades are more likely to experience a current account reversal. Furthermore we find evidence for serially correlated error components and weak evidence of state dependence of the propensity to experience a current account reversal.

#140: **Long memory modelling of inflation with stochastic variance and structural breaks**

Presenter: Charles Bos@VU University Amsterdam, Netherlands
Co-authors: Siem Jan Koopman, Marius Ooms

We investigate changes in the time series characteristics of postwar U.S. inflation. In a model-based analysis the conditional mean of inflation is specified by a long memory autoregressive fractionally integrated moving average process and the conditional variance is modelled by a stochastic volatility process. We develop a Monte Carlo maximum likelihood method to obtain efficient estimates of the parameters using a monthly dataset of core inflation for which we consider different subsamples of varying size. Based on the new modelling framework and the associated estimation technique, we find remarkable changes in the variance, in the order of integration, in the short memory characteristics and in the volatility of volatility.

#152: **Long-term strategic asset allocation: an out-of-sample evaluation**

Presenter: Bart Diris@Maastricht University, Netherlands
Co-authors: Franz Palm, Peter Schotman

We investigate the out-of-sample performance of strategic asset allocation models. We analyze both naive and Bayesian approaches with (un)restricted weights and this requires us to rely heavily on computationally intensive numerical solutions. We repeatedly solve large models and therefore grid search on portfolio weights in the standard simulation approach for dynamic portfolios is computationally too expensive. We refine this method by parameterizing regression coefficients in regressions that approximate conditional utility by quadratic functions of portfolio weights. Optimal weights along each path can be found analytically by optimizing a quadratic function. This refined method is significantly faster since we only have to consider a small grid to accurately parameterize the portfolio weights: we report speed gains of a factor 100 with a negligible impact on accuracy. The empirical results show that strategies could lead to very unstable results unless shrinkage estimators are applied. Dynamic strategies outperform myopic strategies only when using shrinkage. Shrinkage is implemented by using a shrinkage prior in a VAR(1) model. This prior shrinks all coefficients to zero except for the autocorrelations of the state variables. Certainty equivalence returns increase to more than 10strategies avoid extreme events and result in less variable portfolio weights.

#252: **Principal components for gradients of sparse functional data**

Presenter: Ian McKeague@Columbia University, USA
Co-authors: Sara Lopez-Pintado

This talk discusses an imputation method for generating missing values of sparse functional data. The data consist of observations of smooth curves (e.g., growth curves) at sparse time points, and the problem is to find a way to carry out functional principal components analysis of unobserved gradients (e.g., growth rates). Existing approaches are only appropriate when the aggregated time points become dense, and are not specifically tailored to gradients. We introduce a way of imputing the gradients that is consistent with the data, and that provides a natural and direct method of estimating their covariance kernel and principal components.

#188: **Term structure estimation and highly persistent processes in a Bayesian context**

Presenter: Leopold Sogner@Vienna Universtiy of Technology, Austria

Interest rate data exhibits a high degree of serial correlation. When using even simple affine term structure models, this results in a Fisher information matrix close to singularity. Here the standard deviation of the parameters controlling the mean of the process is going to explode. In this paper we investigate this problem in a Bayesian context. We apply Markov Chain Monte Carlo simulation techniques in connection with regularized priors, to simulate the joint posterior distribution of the model parameters. With these priors we derive a proper posterior, however the standard deviations of the estimates remain high. In addition priors are constructed to reduce the variance of these highly volatile parameter estimates. Second, when considering times series from the fixed income sector we observe yields for different maturities. In financial econometrics two approaches are used to estimate the model parameters: either by assuming that all yields are observed with market micro structure noise or that some time series are observed without noise. The second contribution of this paper is an in-depth investigation of these approaches. We demonstrate that if the percentage of market micro structure noise is low, the latter approach provides us with reliable parameter estimates and the computational burden is low compared to the first approach. This econometric analysis, including a stability analysis, is performed with simulated data.

CS33 Room: B013 ECONOMETRIC ANALYSIS OF FINANCIAL MARKETS Chair: Ana-Maria Fuertes

#44: **On the adequacy of the GMM method for conducting inference within the MDH model: A Monte Carlo study**

Presenter: Marwan Izzeldin@Lancaster University, UK
Co-authors: Ana-Maria Fuertes

The GMM procedure has been considered in many studies as being a direct method for testing the validity of Mixture of distribution hypothesis of Clark (1973) and its extensions. In many occasions, results obtained were inconclusive and contradictory. Such mixed evidence can be attributed to factors related to both the MDH model and the GMM method. In this study we consider a Monte Carlo study which mainly looks at factors related to the latter. For example, the nature of the moment structure, the number of estimated moments, the effect under higher moments, and the finite sample properties of the test of overidentifying restrictions. Our noteworthy findings include: First, in terms of the moment structure, we found that the bivariate moment structure of Tauchen

and Pitts (1983) leads to more precise estimates of the latent analystical moments (i.e moments of the information flow) relative to those obtained using the univariate moment structure of Clark (1973). Second, the finite sample properties of test of overidentifying restrictions, was found to suffer from acute size distortions. Third, we found that adding higher moments for a fixed sample size reduces parameter efficiency, on the contrary increasing the sample size for a fixed sample size results in parameter efficiency being increased. Fifth, assuming a non-zero value for the time varying mean of the returns results in parameter estimates less precisely. In summary the GMM produces efficient estimates for the following: small number of moments, large sample sizes, Bivariate moment structure, higher moments if aided with more moment conditions, and when the returns mean is assumed to be zero. For the test of overidentifying restrictions, size distortions are common under all the above cases, but with tendency to improve with the sample size.

#11: **Pricing libor options**

Presenter: Jing-Ming Kuo@University of Essex, UK
Co-authors: Xiaoquan Liu, Jerry Coakley

We price moneyness-based portfolio returns on the LIBOR futures options in the Intertemporal CAPM framework as an extension of the pricing kernel approach. In contrast to existing studies for pricing index options, our results show that only the real interest rate is included in the pricing kernel for the LIBOR options. For the functional form of the pricing kernel, the polynomial pricing kernel with linear interpretation outperforms the iso-elastic form. In particular, the 4-term polynomial approximation dominates the 3-term extension in the HJ distance comparison.

#18: **A new way of measuring the quality of stock market**

Presenter: Oscar Martinez@University Rovira i Virgili, Spain

In this paper we present a new method to measuring the deviations between actual transaction prices and implicit efficient prices. Following the Hasbrouck approach we decompose security transaction prices into a random-walk and stationary components. The random walk component may be identified with the efficient price. The stationary component, the difference between the efficient price and actual transaction price, is termed the pricing error and its dispersion is a measure of market quality. The traditional solutions for the permanent-transitory decomposition proposed by the signal extraction literature through unobserved components and ARIMA models based identification have a serious drawback; the identification assumption is not testable. To avoid this problem we propose a new nonlinear permanent-transitory decomposition based on a threshold integrated moving average model. These models allow us to carry on a new way to identify a permanent shock and a transitory shock. The great advantage is that we can easily test the identification assumptions used in this non-linear decomposition. The new method is applied to US stock prices.

#142: **On some mixture distributions and their extreme value behavior**

Presenter: Jae Hoon Jho@Cass Business School, UK
Co-authors: Vladimir Kaishev

Modeling tail behavior of insurance risks with extreme value theory has been investigated by numerous authors in the past. Motivated by the excess of loss reinsurance contract, in this paper we introduce three mixture distribution models in the context of general insurance applications: i) the layer mixture model; ii) the linear mixture model; iii) the conditional layer mixture model, associated with a sequence of thresholds. We examine the asymptotic tail behavior of each mixture model with respect to the maximum domain of attraction of the distributional components. We show that the hazard rate function of the mixture distribution possesses some similarity in terms of mixing its components: the hazard rate function of a conditional layer mixture distribution is a simple mixture of the hazard rate functions of the distributional components, and hence the conditional layer mixture distribution can be easily obtained by mixing hazard rate functions, which is a unique property among all mixture models. Further we generalize the conditional layer mixture model to the infinite conditional layer mixture model which provides a possible solution to the threshold selection problem. A mixture distribution of continuously varying distributional components can be modeled by the limiting distribution of the infinite conditional layer mixture distribution and the resulting limiting distribution is differentiable if each distributional component is differentiable. (Re)insurance applications and numerical illustrations are also provided.

#43: **On forecasting daily stock volatility: the role of intraday-information and market conditions**

Presenter: Ana-Maria Fuertes@Lancaster University, UK
Co-authors: Marwan Izzeldin, Elena Kalotychou

Several recent studies advocate the use of nonparametric estimators of daily price variability that exploit intraday information. This paper compares four such estimators, realised volatility, realised range, realised power variation and realised bipower variation, both by examining their distributional properties and by ranking them from a forecast viewpoint when the object of interest is the usual conditional variance. The forecast comparison is conducted in a GARCH-augmented framework and is based on a 7-year sample of transaction prices for 14 stocks traded on the NYSE. The forecast evaluation relies on several (a)symmetric loss functions. The realized range fares relatively well in the in-sample fit analysis, for instance, regarding the extent by which it brings normality in returns. However, overall the realised power variation provides the most accurate one-day-ahead forecasts out-of-sample. Forecast combination of all four intraday measures produces the smallest forecast errors in about half of the sampled stocks. A market conditions analysis reveals that the additional use of intraday data on day t to forecast volatility on day t+1 is most advantageous when day t is a low volume or an up-market day. The results have implications for value-at-risk analysis.

Friday 20.06.2008 14:00-16:00 Parallel Session G

ES11 Room: B103 ROBUST METHODS FOR DATA ANALYSIS Chair: Mia Hubert

#13: **Computing robust GMM estimators**

Presenter: Jan Kalina@Charles University in Prague, Czech Republic

The paper proposes an algorithm for computing the weighted generalized method of moments (WGMM) estimator, which is a robust analogy of the GMM estimator based on down-weighting less reliable observations. This estimator with a high breakdown point is an analogy of the least weighted squares estimator from the linear regression context. Further we study computational aspects of the instrumental weighted variables (IWV) estimator, which is a robust analogy of the instrumental variables and a special case of the WGMM estimator.

#34: **Robust support vector machine classification**

Presenter: Michiel Debruyne@Universiteit Antwerpen, Belgium

The Support Vector Machine (SVM) is a binary classification method with several interesting properties. First it has the ability to produce good predictions in high dimensions by appropriate regularization. Secondly the computational complexity only depends on the number of inputs allowing for fast results irrespective of the dimensionality of the data. Finally SVM does not only work for linear classification in an Euclidean space, but it can be extended to a Reproducing Kernel Hilbert Space (RKHS). In practice it is observed that outliers can have a large impact on a SVM classifier. In this talk a practical proposal is made to improve the robustness of SVM classification, at the same time retaining the fast computation and the ability to work in an arbitrary RKHS. To this end the Stahel-Donoho outlyingness is used. It is shown how to compute this outlyingness measure in a RKHS extending the original definition in a Euclidean space. A robust SVM is constructed by applying ordinary SVM to a fraction of inputs with smallest outlyingness. A diagnostic plot is discussed visualizing high dimensional data by plotting the Stahel-Donoho outlyingness versus the values of the SVM classifier. Illustrations are provided for microarrays and spectral data.

#38: **Robust online scale estimation in time series: a model-free approach**

Presenter: Sarah Gelper@Katholieke Universiteit Leuven, Belgium

This paper presents variance extraction procedures for univariate time series. The volatility of a times series is monitored allowing for non-linearities, jumps and outliers in the level. The volatility is measured using the height of triangles formed by consecutive observations of the time series. This idea was already studied for bivariate data and is extended to apply for online scale estimation in time series analysis. The statistical properties of the new methods are derived and infinite sample properties are given. A financial and a medical application illustrate the use of the procedures.

#62: **Robust estimation of parameters of a truncated bivariate normal distribution**

Presenter: M. Rosario de Oliveira@Instituto Superior Tecnico and CEMAT, Portugal
Co-authors: Antonio Pacheco, Claudia Pascoal, Rui Valadas, Paulo Salvador

This work was motivated by the study of the dependencies between Internet traffic characteristics, which is important in the development of more realistic Internet traffic models of applications and services. An Internet flow is characterized by duration, size, and rate, with the rate being the ratio between size and duration. For real data sets, physical constraints impose upper-bounds on the durations and rates of measured flows. Assuming that the logarithm of the size and the logarithm of the duration have a bivariate normal distribution, the samples can be regarded as realizations of a truncated bivariate normal distribution, in a certain domain. In this paper we present some theoretical results regarding the truncated bivariate normal distribution as well as an estimation procedure, which is adversely influenced by atypical observations. In addition, an estimation method based on robust moments is proposed since for real problems it is expected that the distributional assumption only holds approximately.

#101: **A robust transformation to symmetry**

Presenter: Mia Hubert@Katholieke Universiteit Leuven, Belgium
Co-authors: Stephan Van der Veeken

Several strategies can be followed in order to detect outliers in skewed univariate data. The first approach assumes a particular parametric model, and estimates the parameters robustly. To avoid this parametric assumption, we have recently proposed a distribution-free method, which is based on a robust measure of skewness. We now present a new method by robustly transforming the data to symmetry. To this end, we use a maximum trimmed likelihood estimator. We show on real and simulated data that we attain a high resistance to outliers. Moreover, by combining this method with projection pursuit, also outliers in skewed multivariate data can be detected.

ES14 Room: B013 COMPUTATIONAL STATISTICS IN LEARNING Chair: Cira Perna

#66: **A majorization algorithm to linear support vector machines with different hinge errors**

Presenter: Patrick Groenen@Erasmus University Rotterdam, Netherlands
Co-authors: Georgi Nalbantov, Cor Bioch

Support vector machines (SVM) are becoming increasingly popular for the prediction of a binary dependent variable. SVMs perform very well with respect to competing techniques. Often, the solution of an SVM is obtained by switching to the dual. In this paper, we stick to the primal support vector machine (SVM) problem, study its effective aspects, and propose varieties of convex loss functions such as the standard for SVM with the absolute hinge error as well as the quadratic hinge and the Huber hinge errors. We present an iterative majorization algorithm that minimizes each of the adaptations. We illustrate this with an example from the literature and do a comparison of different methods on several empirical data sets.

#113: **Regression subset selection with non-negative coefficients**

Presenter: Cristian Gatu@VTT Finland, Finland
Co-authors: Erricos John Kontoghiorghes

The problem of subset selection of the linear regression model where the regression coefficients are known to satisfy non-negativity constraints is considered. An algorithm that derives the constrained solution by solving a number of unrestricted least squares subproblems is introduced. The method is based on a regression tree structure that generates all possible submodels. The main computational tool is the QR factorization and its modification. The adaptation of a branch-and-bound device that prunes non-optimal subtrees while searching for the best submodels is also described. Experimental results that show the efficacy of the new method are presented and analyzed.

#106: **Partial logistic artificial neural networks for the flexible modelling of censored survival data**

Presenter: Elia Mario Biganzoli@Universita degli Studi di Milano, Italy
Co-authors: Federico Ambrogi, Patrizia Boracchi

Linear and non-linear flexible regression analysis techniques, such as those based on splines and feed forward artificial neural networks (FFANNs), have been proposed for the analysis of censored survival time data. Among survival functions, the hazard has a biological interest for the study of the disease dynamics. Starting from generalized linear models (GLM) with Poisson or binomial errors and piecewise parametric or grouped time survival models, their extension as FFANNs has been proposed, allowing for non-linear and non-proportional effects of covariates. This led to Partial Logistic Artificial Neural Network (PLANN) discrete time models and their extension to the competing risks framework (PLANNCR). They can provide relevant indications on the underlying risk patterns, thus substantially contributing to the individual risk profiling. According to standard practice, penalized estimation was adopted to modulate model complexity. Statistical approaches for choosing the size of the weight decay term, based on the expected test error, were proposed. Namely, the Network Information Criterion (NIC), the ICOMP criterion and Non Linear Cross Validation (NLCV). In further developments model selection was performed according to a Bayesian extension or using Genetic Algorithms. Aim of the work is to present the evolution of PLANN modeling approaches, showing applications in oncology studies.

#95: **Multiple testing for variable selection in neural network models**

Presenter: Cira Perna@University of Salerno, Italy
Co-authors: Michele La Rocca

Artificial neural networks are widely accepted as a potentially useful way of modelling non linear relationships. Their success is due to the great flexibility and capability of providing a model which fits any kind of data with an arbitrary degree of accuracy. A crucial point, when using a neural network model, is the choice of a proper topology which is basically related to the specification of the type and the number of the input variables. The aim of this talk is to present and discuss an input selection algorithm based on a multiple testing procedure. It uses a recent proposal to take under control the familywise error rate in order to avoid the data snooping problem. Moreover, the procedure uses the subsampling which gives consistent results under quite general and weak assumptions and allows to overcome the analytical and probabilistic difficulties related to the estimation of the sampling distribution of the test statistics. Some results on simulated data show that the proposed testing procedure is an effective criterion for selecting a proper set of relevant inputs for the neural network model.

ES20 Room: GB1 COMPUTATIONAL STATISTICS IN LIFE SCIENCES Chair: Athanassios Kondylis

#89: **Accounting for uncertainty around the incremental cost-effectiveness ratio adjusted by the quality of life**

Presenter: Carole Siani@University Claude Bernard Lyon 1, France
Co-authors: Christian de Peretti, Gerard Duru

In cost-effectiveness analysis (CEA), one or more medical treatment(s) are compared with a standard treatment on the two-fold basis of cost and medical effectiveness. The results are generally expressed in terms of an incremental cost-effectiveness ratio (ICER) by decision-makers, or more recently in terms of, an ICER adjusted by the quality of life (expressed as a cost per QALY gained). The QALY is measured by the EuroQol, that is often interpolated. The purpose of this paper is to build a confidence region around the adjusted ICER, accounting for the uncertainty coming from the EuroQol interpolation. We enlighten that the

EuroQol interpolation increases dramatically the uncertainty around the adjusted ICER so that the conclusions are not reliable. The first step of the paper is to build a confidence region around the adjusted ICER. Two approaches are proposed. First, we adapt Fieller's methodology to the adjusted ICER: we extend the Gaussian case of Fieller's method to a more general case for accounting for the QALY. Second, we also propose parametric and nonparametric bootstrap procedures, since a closed form solution is not necessarily available depending on the specification of the probability distribution of the QALY. The second step of the paper is to include the EuroQol interpolation procedure in the theoretical procedure as well as in the bootstrap procedure to build the confidence region ICER. This permits to recompute the confidence region for the ICER and then to reassess the uncertainty. Monte Carlo experiments are also carried out to assess the performance of the various methods. Finaly, the methods are then applied to real data.

#118: **A multiple random classifiers strategy for the ab initio core promoter recognition in Nicotiana tabacum**

Presenter: . . . . . Florian Martin@Philip Morris International R&D (PMI), Switzerland
Co-authors: . . . . . Nikolai Ivanov, Irfan Gunduz

Unbalanced classification tasks are common in real-life applications such as security breach, fraud detection and handwritten numeral recognition, as well as in bioinformatics. There are multiple problems encountered with large datasets and highly unbalanced classes, including speed of computation, memory limits, and high false positive rate for the smallest classes affecting many learning algorithms. The ab initio core promoter prediction in DNA sequences is one such problem. As promoters are relatively rare in the genome, training sets contain many more non-promoter DNA sequences (tens of thousands) than core promoter sequences (a few hundred). Combining undersampling and boosting strategy, a computationally efficient methodology dealing with highly unbalanced binary classification problems has been developed to adress the issues mentioned above. The proposed approach outperforms many classical supervised classification methods, such as linear discriminant analysis, AdaBoost, c-SVM, one-class SVM, Naive Bayes classifier, and Random Forest. From the Tobacco Genome Initiative sequences, an ab initio core promoter prediction model was trained, leading to a g-performance index of 0.86. The prediction of core promoter regions of the whole Nicotiana tabacum genome was carried out: 569'655'717 window frames were predicted from 800'402 contigs resulting in 74'356 potential promoter regions.

#40: **Modeling of infectious disease dynamics based on a simultaneous use of multiple information inputs**

Presenter: . . . . . Dominik Heinzmann@University of Zurich, Switzerland
Co-authors: . . . . . Simon Ruegg, A.D. Barbour, Paul Torgerson

Epidemiological field data often contains information on the presence of the parasite (e.g. determined by Polymerase Chain Reaction (PCR)) and of antibodies (e.g. determined by Immuno Fluorescence Antibody Test (IFAT)). Incorporating those different sources of information and testing if the additional information input improves the description of the infectious disease dynamics are two important concepts to obtain an appropriate insight into the transmission process. A mathematical modeling approach is presented which describes the transmission dynamics by simultaneously using antigen and antibody information and which allows to determine the statistical significance of incorporating multiple information sources. The approach features a biologically meaningful relationship to the underlying transmission process. Statistical comparison of the models using different (single/multiple) information sources is done by likelihood-ratio tests where the empirical distribution function of the test statistics is computed by Monte-Carlo simulations. The usefulness of this computational procedure is shown under violation of standard MLE assumptions (e.g. if there is a non-nested model structure). The demonstration of the usefulness of the presented computational approach is based on serological data of domestic horses from a study in Mongolia and consists of PCR and IFAT measurements for two protozoa.

#58: **Finding profiles in microarray time-course experiments with replicates.**

Presenter: . . . . . Itziar Irigoien@Euskal Herriko Unibertsitatea - University of Basque Country, Spain
Co-authors: . . . . . Sergi Vives, Concepcion Arenas

Time-course studies with microarray techniques and experimental replicates provide enormous potential for exploring the mechanisms underlying biological phenomena. However, the large volume of gene expression data generated by such studies, along with the difficulties introduced by experimental replication, are a challenge to data analysis. The aim of this work is to find clusters of genes with similar expression pattern, and to detect genes with differences between its replicates. So, a new distance function and a new approach are developed. Our approach presents the following steps: 1) Filter out not expressed genes. 2) Separate two groups of genes: those showing differences between replicates (group 1) and those without significant differences between them (group 2). 3) Concerning genes in group 1, a new distance matrix is defined. A cluster procedure and a rule which determines the total number of clusters are proposed. Finally, the different types of clusters profiles are identified. 4) Concerning genes in group 2, the procedure detects where the differences between replicates lie and determines whether the gene's expression profile is similar to one of those identified in the previous clustering process or, it defines a new profile.

#112: **Adaptive preconditioning of Krylov subspaces and PLS regression**

Presenter: . . . . . Athanassios Kondylis@PMI R&D, Switzerland
Co-authors: . . . . . Joe Whittaker

Modern statistical practice often requires analyzing data sets with a large number of highly correlated variables. This is common in life science applications and especially in chemometrics and in environmetrics. In such cases, near collinearity inflates variance of the estimated coefficients while overfitting may lead to models with low predictive power on new observations. Partial Least

Squares (PLS) regression is a regularization regression method that retains a few orthogonal derived components in the regression problem instead of the numerous interrelated original variables. We propose a modification of PLS regression which adaptively shrinks the smaller regression coefficients towards zero. The coefficient vector is shrunk within the framework of a Krylov space approximation. The method is carried out by preconditioning the gradients by a diagonal matrix whose elements reflect the relative importance of the predictors. The objective is to reduce the dimension of the regression problem and to recover solutions which are relatively easy to interpret, without losing the good predictive performance of PLS.

CS10 Room: E003 BAYESIAN ANALYSIS OF LATENT VARIABLE AND VOLATILITY MODELS Chair: Yasuhiro Omori

#26: **Tobit model with covariate dependent threshold**

Presenter: Koji Miyawaki@University of Tokyo, Japan
Co-authors: Yasuhiro Omori

This article discusses a Bayesian analysis of the Tobit model where the deterministic threshold is allowed to depend on individuals' characteristics. In this model, the parameters are subject to as many inequality constraints as the number of observations, and the maximum likelihood estimation which requires the numerical maximisation of the likelihood is difficult to be implemented. Using a Bayesian approach, we construct a simple and efficient Gibbs sampler algorithm. The convergence of the sampler is accelerated by introducing an additional scale transformation step to the original Gibbs sampler. We illustrate our procedure using the simulated data and then analyze the popular hourly wage data of married women. Our proposed model is also extended for the friction model and is applied to Japanese call money-rates data.

#27: **Electric demand forecasting by bayesian spatial autoregressive seasonal ARMA (p,q) model**

Presenter: Kazuhiko Kakamu@Chiba University, Japan
Co-authors: Yoshihiro Ohtsuka, Takashi Oga

This paper examines the regional electric demand and the spatial interaction among the regions from a Bayesian point of view. To take features of regional electric demand in Japan into account, we propose a spatial autoregressive seasonal ARMA (p,q) model and construct the strategy of Markov chain Monte Carlo (MCMC) methods to estimate the parameters of the model. We found that there exists seasonality and that the spatial interaction played an important role.

#46: **Bayesian analysis of spatial stochastic frontier models**

Presenter: Hideo Kozumi@Kobe University, Japan
Co-authors: Koji Miyawaki, Kazuiko Kakamu

This paper considers stochastic frontier models for panel data from a Bayesian point of view. We propose a stochastic frontier model that incorporates spatial effects. We also develop efficient Markov chain Monte Carlo methods based on the recursively truncated multivariate normal distribution. The methods are applied to a real data set.

#50: **Multivariate stochastic volatility models with dynamic correlations: a Monte Carlo particle filtering approach**

Presenter: Hajime Wago@Economic and Social Research Institute, Japan
Co-authors: Koiti Yano, Seisho Sato

This paper proposes Multivariate Stochastic Volatility models with Dynamic Correlations (MSVDC) based on the Monte Carlo particle filter and a self-organizing state space model. In our MSVDC, we estimate dynamic correlations of system errors and measurement errors. In empirical analysis, we estimate the time-varying interaction of credit risk (credit default swap) and market risk (stock price index) using MSVDC. We conclude the correlations of returns and volatilities become higher in financial crises. Our findings indicate that it is inadequate to estimate the interaction of credit and market risks based on invariant parameters.

#157: **Bias corrected realized volatility with dependent microstructure noise**

Presenter: Kosuke Oya@Osaka University, Japan

Realized volatility is the standard estimator for the integrated volatility of diffusion process using high frequency financial data. However, it is well-know that RV deteriorates as the return interval becomes very short. Market microstructure effects such as bid-ask bounce causes the deterioration in RV. Although there are several estimators suitable for the high frequency data contaminated by microstructure noise which is not serially dependent, they suffer from non-negligible effect by serially dependent noise. In this paper, we propose two estimators for the integrated volatility when the microstructure noise is serially dependent. The proposed estimators utilize the auto-covariance estimates of microstructure noise. One is naive method that consists of the estimates of auto-covariances. The other is based on the AR(p) approximation. Once the auto-covariances of the microstructure noise are given, it is possible to estimate the AR model of order p that approximates the noise process. The estimator is constructed using the auto-covaraiances through the AR model. Both methods can handle the un-evenly sampled high frequency data.

CS19 Room: B217 COMPUTATIONAL ECONOMETRICS - 1 Chair: Peter Wechselberger

#147: **Sparse and stable Markowitz portfolios**

Presenter: Christine De Mol@Universite Libre de Bruxelles, Belgium
Co-authors: Joshua Brodie, Ingrid Daubechies, Domenico Giannone, Ignace Loris

The Markowitz mean-variance optimizing framework has served as the basis for modern portfolio theory for more than 50 years. However, efforts to translate this theoretical foundation into a viable portfolio construction algorithm have been plagued by technical difficulties stemming from the instability of the original optimization problem with respect to the available data. We reformulate the problem as a constrained least-squares regression problem and we propose to add to this quadratic objective function a penalty proportional to the sum of the absolute values of the portfolio weights (L1-type penalty). This penalty not only regularizes (stabilizes) the optimization problem, but also encourages sparse portfolios, namely portfolios with only few active positions corresponding to the non-zero weights. Moreover, the penalty has a natural interpretation in terms of transaction costs which are thus controlled in a transparent way. We implement this methodology on several benchmark portfolio datasets. Using only a modest amount of training data, we construct portfolios whose out-of-sample performance, as measured by Sharpe ratio, is consistently and significantly better than that of the naive portfolio comprising equal investments in each available asset and constituting, as shown in recent literature, a very tough benchmark for portfolio construction.

#168: **On-line state and parameter estimation of Cox process.**

Presenter: Miguel A.G. Belmonte@University of Warwick, UK
Co-authors: Omiros Papaspiliopoulos, Michael Pitt

We consider inference for Cox processes in time where the intensity is a parametrised function of an unobserved diffusion process. We design a particle filter for on-line estimation of the intensity function. We apply the smooth particle filter methodology to obtain maximum likelihood estimates of unknown parameters of the diffusion. The filter relies on time discretisation in order to approximate the conditional density of data given the signal. We illustrate the performance of the algorithm with duration data. On-line estimated distribution functions are used to assess the validity of the Cox process as a continuous time model for financial durations. Furthermore, we benchmark our results against those yielded by traditional discrete time econometrics models.

#144: **The efficient frontier as a stochastic phenomenon**

Presenter: Wolfgang Rinnergschwentner@University of Innsbruck, Austria

The efficient frontier by Markowitz is based on two stochastic components: the vector of returns and the variance covariance matrix of the relevant assets. In the literature the impact of the estimation error of the variance covariance matrix on the efficient frontier has still been neglected. The following study attempts to analyze the consequences of the randomness of variance covariance matrices for practical issues. The computation of the variance covariance matrices is based on various theoretical distributions and on a Monte Carlo simulation. The necessary assumptions are checked for validity. Computation of the efficient frontiers is based on the Markowitz algorithm. The confidence intervals of the efficient frontier are determined with the help of simulations. These simulations are based on the Wishart distribution, the normal distribution and on computations with rolling windows. The portfolio risk can be clearly underestimated if theoretical distributions are used for variance covariance matrices. Portfolio weights of the risk/return combinations at the boundaries of the confidence interval have a very large range when the computation is based on rolling windows. The portfolio based on the efficient frontier is not necessarily efficient anymore.

#189: **Visual recurrence analysis of simulated foreign exchange rate with encryption scheme for color images**

Presenter: Ladislav Lukas@University of West Bohemia in Pilsen, Czech Republic

This paper presents both the analytic formulation of FX rate models which are used for time series simulation and their visual recurrence analysis based upon technique of recurrence plots extended with encryption scheme. First, various dynamic nonlinear models based upon market clearing conditions applied to FX rate are presented. The presented simulated FX rate time series are focused upon various central bank strategies, which are further analysed by visual recurrence techniques. Recurrence plots are the 2-D representations of such time series, which contain various patterns corresponding the central strategies modeled. Generally, produced images are submitted for further qualitative and/or quantitative analysis. In order to facilitate transfer of such images over untrusted channels various image encryption scheme are used. The paper also discusses a recent cost-effective encryption scheme, which performs altering both the spectral correlation among pixel color components and the spatial correlation of the neighboring color vectors of the original image.

#59: **Random scaling of nonlinear functions**

Presenter: Peter Wechselberger@University of Innsbruck, Austria
Co-authors: Stefan Lang, Winfried Steiner

We present Bayesian inference based on Markov Chain Monte Carlo (MCMC) techniques to estimate multiplicative effects of the form g(z)*f(x). The second function is a nonlinear function of covariate x. The first function can represent a random effect, thus modifying the influence of x, where the random effect may be spatially correlated. Alternatively, g(z) can be a nonlinear function of the covariate z, giving an alternative to usual surface estimators. The methodology may be embedded in a general regression framework with structured additive predictor. Our work is motivated by the situation of a retailer planning a price reduction. Relating sales to the price of the product as well as to the price of competitive products, a price-response-function can

be estimated. Monotonicity constraints can be imposed so that the own price is inversely related and the prices of competitive products are directly related to the number of sold items. Unobserved heterogeneity is taken into account by allowing the response function to vary between different outlets. A second application is rent data. The influence of continuous covariates (e.g. area, date of construction) is likely to be of nonlinear form. The strength of the influence though can vary across districts.

CS20 Room: AUM ECONOMETRIC METHODS AND APPLICATIONS FOR FINANCIAL TIME SERIES Chair: Giampiero Gallo

#63: **Measuring and modeling tick-by-tick stock-bond realized correlation**

Presenter: Fulvio Corsi@University of Lugano, Switzerland
Co-authors: Francesco Audrino

We first introduce tick-by-tick covariance estimators adapted to the case of rounding in the price time stamps to a frequency lower than the typical arrival rate of tick prices. We investigate, through Monte Carlo simulations, the behavior of such estimators under realistic market microstructure conditions analogous to those of the financial data studied in the empirical section; that is, non-synchronous trading, general ARMA structure for microstructure noise, and true lead-lag cross-covariance. Simulation results show the robustness of the proposed tick-by-tick covariance estimators to time stamps rounding, and their overall performance superior to competing covariance estimators under empirically realistic microstructure conditions. We then propose a tree-structured heterogeneous autoregressive (Tree-HAR) process as a simple and parsimonious model for the estimation and prediction of tick-by-tick realized correlations. The model can account for different time and other relevant predictors' dependent regime shifts in the conditional mean dynamics of the realized correlation series. Testing the model on S&P 500 and 30-year treasury bond futures realized correlations, we provide empirical evidence that the Tree-HAR model reaches a good compromise between simplicity and flexibility, and yields accurate single- and multi-step out-of-sample forecasts which compare favorably to those obtained from other standard approaches.

#201: **The analysis of multivariate returns via asymmetric archimedean copulae**

Presenter: Giovanni De Luca@University of Naples Parthenope, Italy
Co-authors: Giorgia Rivieccio, Paola Zuccolotto

Financial asset returns are characterized by a complex set of relationships, so that a multivariate approach is generally able to significantly improve the analysis. Nevertheless, a growing number of jointly modelled variables produces an increasing formal and computational complexity, which rapidly becomes hard to manage. For this reason a preliminary variable selection is crucial in this context. Given P assets, we could desire to choose the p assets having the lowest negative tail dependences with a reference asset. The choice can be made by means of a data mining technique, able to select the most important predictors in a classification problem, using tree-based learning ensembles. In a statistical perspective, the multivariate analysis of financial asset returns have suffered from the (ab)use of the hypothesis of Gaussianity. Copula functions have become a significant quantitative tool because of their aptitude to analyse, separately, the behaviour of the marginal distribution and the specification of the whole dependence structure. The most popular copula families are the Elliptical and the Archimedean. However, in the most prominent Elliptical copulae, the Gaussian and the t-copula, the dependence in the lower and upper tail of the joint distribution is, respectively, absent or symmetric. Archimedean copulae do have the advantage of allowing possibly different lower and upper tail dependence. However, in the multivariate case, they have the undesirable exchangeability property, implying the same tail dependence between any pair of the analysed variables. An asymmetric multivariate Archimedean copula function, constructed by a hierarchical structure, allows to overcome this drawback. After coupling the variables with the strongest degree of dependence through a copula function, this is joined with another variable and so on, in a continuous process of assembling. A case study is presented with geographical MSCI equity indices.

#139: **Model and distribution uncertainty in multivariate GARCH estimation**

Presenter: Eduardo Rossi@University of Pavia, Italy
Co-authors: Filippo Spazzini

The literature on multivariate GARCH models shows that this class of multivariate volatility models is able to accommodate dynamic correlations although with the disadvantage, when the number of series considered is large, that the parameterizations suffer from having too many parameters. In general, the interaction between model parametrization of the second conditional moment and the conditional density of asset returns adopted in the estimation determines the fitting of such models to the dynamic correlations. This paper tries to evaluate and identify the best compromise between a flexible correlation specification and a probability distribution capable to model the tail behavior of the data more adequately than the Normal. The purpose is to evaluate, by means of Monte Carlo simulations, the impact of the joint misspecification of the conditional covariance process, as represented by some popular multivariate GARCH models, and of the log-likelihood used in the estimation on the prediction performance and portfolio optimization procedures.

#241: **Parametric and nonparametric methods for clustering of financial time series**

Presenter: Jorge Caiado@ESCE/Polytechnic Institute of Setubal and CEMAPRE, Portugal
Co-authors: Nuno Crato

The identification of similarities or dissimilarities in financial time series has become an important research area in finance and empirical economics. In stock markets, the examination of mean and variance correlations between asset returns can be useful for portfolio diversification and risk management purposes. A fundamental problem in cluster analysis of financial time series

is the choice of a relevant metric. Some authors used the Pearson correlation coefficient as similarity measure of a pair of stock returns. Although this metric can be useful to ascertain the structure of stock returns movements, it does not take into account the stochastic dependence of the processes and cannot be used for comparison and grouping stocks with unequal lengths. In order to capture the correlation structure and the spectral behavior of the time series, we may use measures of distance based on the sample autocorrelations and the periodogram ordinates of the returns and volatilities. We know that autocorrelation and spectral methods can work very well for comparing time series. In order to capture the conditional variance or volatility of the processes, we may use measures of distance based on the autoregressive conditionally heteroskedastic (ARCH) model estimates and its extensions. In this paper, we provide a comparison of different distance-based methods for clustering of financial time series. Building on the recent literature of international equity market linkages, we use stochastic nonparametric and parametric approaches to investigate the similarities and dissimilarities between countries. Data used in this study are daily stock markets returns and weekly and monthly realized volatility based on daily data for 15 of the major international stock markets. In order to summarize and better interpret the results, we suggest using a multidimensional scaling map to explore the existence of clusters.

CS21 Room: ALG TIME SERIES COMPONENTS AND VOLATILITY Chair: D. Stephen G. Pollock

#64: **The relationship between ARIMA-GARCH and unobserved component models with GARCH disturbances**

Presenter: ..... Esther Ruiz@Universidad Carlos III, Spain
Co-authors: ..... Antoni Espasa, Santiago Pellegrini

It is well known that time series with stochastic trends can be represented by ARIMA models which are characterized by having a unique disturbance and, consequently are simple. Alternatively, unobserved component models define specific disturbances in each component. This paper analyzes the consequences of fitting ARIMA-GARCH models to series generated by conditionally heteroscedastic unobserved component models which allow distinguishing which components are heteroscedastic. Furthermore, if an ARIMA-GARCH model is fitted to a conditionally heteroscedastic unobserved component series, it could hide the source and level of uncertainty and in some cases could lead to wrongly reject heteroscedasticity. Another objective of this paper is to study the forecasting performance of unobserved component models with heteroscedastic errors and ARIMA-GARCH models. We show that in the former case, depending on whether the heteroscedasticity affects the short or the long-run noise, the prediction intervals could be different. However, the ARIMA-GARCH model is not able to distinguish whether the heteroscedasticity appears in the transitory or the permanent component. Therefore, the prediction intervals could be inaccurate in the sense that their coverage differs from the nominal.

#81: **Nonlinear transformation in MEM-GARCH for robust volatility forecasting**

Presenter: ..... Kai Lam@Chinese University of Hong Kong, Hong Kong

Conventional GARCH models rely on a historical record of daily returns for predicting the conditional variance of a time series. Using intra-daily information embedded in high-frequency realized variance, more precise prediction of the volatility can be performed. However, the direct usage of realized variance as a non-negative input variant in MEM (Multiplicative Error Model) may substantially undermine the precision, apparently due to high sensitivity in estimating the underlying GARCH parameters. The idea of using volatility proxies and loss functions for robust comparison has recently received much attention. We study the problem of using realized variance at different frequencies for such proxies, and consider the merits of a class of MEM-based conditioned variance forecasts using input variant derived by nonlinear transformation of realized variance. Two particular nonlinear transformations, the square root and logarithm, can give less accentuated input variant range and thus reduce significantly the sensitivity of the estimated GARCH parameters. The predicted conditioned variance can then be readily obtained by performing inverse transformation of squaring and exponentiation, respectively. Empirical results using the IBM data set from 1993 to 2003 showed that such MEM-based forecasts can give much improvement over RiskMetrics and 60-day rolling window, as demonstrated by MZ (Mincer-Zarnowitz) regression and DMW (Diebold-Mariano-West) test over different loss functions and volatility proxies. Increased sampling in realized variance was also found to contribute to improved prediction, as verified by a comparison of MEM-based forecasts at 65 minutes and 15 minutes interval.

#171: **Estimating and forecasting yield curve using partial information Kalman filter and DSGE**

Presenter: ..... George Perendia@London Metropolitan University, UK

In recent articles, few authors extend standard Bayesian MCMC DSGE model with bond yield term structures and show superiority of DSGE implementation over structural model implementations in both, estimating and forecasting the economic parameters, yields and yields' spreads. The authors proposed more rigorous model of macro-economy which allows for more rigorous formation of rational expectations of the term structure in DSGE models using the estimated macro-finance model extended with yield model midst arbitrage free RE restrictions. However, most of DSGE solutions assume incorrectly that micro-economic agents have full information of the current and previous states of economy when forming rational expectations. In this research, we apply and show advantages of the recent implementation and extension of Partial Information Kalman filter which corrects the above incorrect assumption and enables a large number of auxiliary, noisy information to augment estimation and forecasting of macroeconomic parameters, variables and term structures within DSGE and Kalman filter based state space models and amid imperfect information conditions.

#65: **The realisation of finite-sample frequency-selective filters**

Presenter: ..... Stephen Pollock@University of Leicester, UK

This paper shows how a frequency-selective filter that is applicable to short trended data sequences can be implemented via a frequency-domain approach. A filtered sequence can be obtained by multiplying the Fourier ordinates of the data by the ordinates of the frequency response of the filter and by applying the inverse Fourier transform to carry the product back into the time domain. Using this technique, it is possible, within the constraints of a finite sample, to design an ideal frequency-selective filter that will preserve all elements within a specified range of frequencies and that will remove all elements outside it. Approximations to ideal filters that are implemented in the time domain are commonly based on truncated versions of the infinite sequences of coefficients derived from the Fourier transforms of rectangular frequency response functions. An alternative to truncating an infinite sequence of coefficients is to wrap it around a circle of a circumference equal in length to the data sequence and to add the overlying coefficients. The coefficients of the wrapped filter can also be obtained by applying a discrete Fourier transform to a set of ordinates sampled from the frequency response function. Applying the coefficients to the data via circular convolution produces results that are identical to those obtained by a multiplication in the frequency domain, which represents a more efficient approach.

CS29 Room: B104 DYNAMICS OF FINANCIAL MARKETS Chair: Maral Kichian

#97: **An empirical investigation of static and time-varying long-range dependence in futures returns**

Presenter: ..... Jian Dollery@University of Essex, UK
Co-authors: ..... Jerry Coakley, Neil Kellard

This paper re-examines futures returns for evidence of persistence behaviour by utilizing a new semi-parametric wavelet-based estimator. This is superior to the popular GPH estimator on the basis of mean squared error. Furthermore, to investigate the assertion of whether long-range dependence is time-varying, we propose the calculation of the wavelet OLS using time windows. The empirical results suggest the presence of fractional integration in the majority of commodity futures returns series. They also provide overwhelming evidence of time-varying long-range dependence in futures returns. This illustrates that the efficiency of the futures market seems to evolve over time.

#209: **Does East affect West? A dynamic spillover analysis between Chinese and US futures markets**

Presenter: ..... Dong Wang@University of Essex, UK
Co-authors: ..... Neil Kellard

This paper investigates spillover effects in mean and variance of returns between developing Chinese futures markets and the corresponding US markets. Using a novel dataset over the entire life span of Chinese futures markets (1993-2007), the important global commodities of soybeans and copper are analyzed by employing an Asymmetric Dynamic Conditional Correlation (ADCC) framework. Our preliminary results are striking. For instance, although the US price is the commonly thought as the world reference price for soybeans, our new results show that the Chinese soybean market influence on its US counterpart became significantly stronger after new regulatory controls were introduced in the late 1990s. Additionally, one of the unique features of Chinese futures markets is the reliance on time-dependent margins. Interestingly, we find that for both copper and soybean markets, Chinese influence on US markets is diminished in the high margin regime. Overall, our results indicate that the relevance of information flow between futures markets can be significantly affected by both regulatory policy and margin rules.

#131: **Nonlinear spot interest rates and bond prices: an empirical study**

Presenter: ..... Chih-Ying Hsiao@University of Technology Sydney, Australia
Co-authors: ..... Carl Chiarella

In this paper we employ the Shoji moment approximation method to calculate continuous-time no-arbitrage bond prices based on nonlinear spot interest rate models and benchmark its efficiency against some known solutions in the affine/quadratic class. We then use the Shoji approximation method to develop maximum likelihood estimators, based on bond prices as the observables, for interest rate models having quite general functional forms for the drift and diffusion coefficients and also for market price(s) of risk. We show that this approach is more efficient than those based on Monte Carlo simulation methods. We test the method on some specific nonlinear interest models using US, EU and Australian data.

#38: **The effectiveness of prepayment penalty ban in Turkey**

Presenter: ..... Orhan Erdem@Istanbul Bilgi University, Turkey

This paper values the prepayment option under two types of prepayment penalties, namely a fixed rate penalty and a yield maintenance penalty. We use the bivariate binomial option pricing technique. Different from their modeling, we add transaction costs for both prepayment and default events, and treat prepayment penalty as prepayment reducing transaction cost. We formulate the prepayment as a call option, and calibrate its price under various prepayment penalties. The legal prepayment penalty upper ban in Turkey which is 2% is our main comparison point. Since there is not much mortgage history and data, an empirical testing of historical data is impossible. That is why we make calibration analysis and discover the consequences of different type of penalties on prepayment risk. The contribution of this paper is policy oriented: we try to evaluate the effect of prepayment penalty on the prepayment option in bivariate binomial option pricing mechanism. This evaluation is done for a specific country, namely Turkey. The legal prepayment penalty upper ban 2percent in Turkey seems very ineffective when we look at the value of the prepayment

option. Thus this study may serve as a guide which shows the actual costs of prepayment penalties in Turkey, and proposes to use a yield maintenance penalty in order not to cause too much burden to the system.

#126: **Fundamental and speculative factors behind the energy price**

Presenter: . . . . . Eric Tham@Standard Chartered Bank, Singapore

In recent years, crude oil price has risen significantly. This rise is explained using a state space regression model with time-varying beta coefficients. The model uses as explanatory variables - fundamentals, refinery utilization, speculative buying and market contango/ backwardation condition with the dependent variable as the Nymex WTI price. The beta coefficients or state variables are modeled as either auto-regressive AR(1) or random walk processes and reflects the changing sensitivity of the oil price to market conditions over the years. The speculative buying is proxied by the non commercial long open interest reported weekly by the CFTC. Crude fundamentals are represented by the days of stock cover from crude oil stocks divided by the products supplied. Refinery utilization is the total crude amount that goes into the refineries. State space model results show that crude price has become more sensitive to speculative buying than fundamentals pressure. This comes about despite a tightening of the supply/ demand situation. The sensitivity to refining intake is also more muted compared to other factor. This tends to be cyclical reflective of seasonal refinery maintenance. The price sensitivity to the backwardation of the futures curve has been less than other factors, indicating diminishing importance of the roll over traditionally employed by funds. Importantly, the fundamentals also do not granger cause speculative buying. The opposite causality is more significant statistically although the effect is still muted. This implies that it is the funds as an exogenous factor that are driving up prices. Though speculative buying has improved the fundamentals situation, other factors are more significant in increasing production, for example supply constraints and OPEC quota.

Friday 20.06.2008 16:25-18:30 Parallel Session H

ES01 Room: B103 ROBUSTNESS IN THEORY AND PRACTICE Chair: Peter Filzmoser

#4: **Applications of robust statistics in operational risk measurement**

Presenter: Sonja Huber@University of Innsbruck, Austria

The quality of operational risk data sets suffers from missing or contaminated data points. This may lead to implausible characteristics of the estimates. Especially outliers can make a modeler's task difficult and can result in arbitrarily large capital charges which are required by regulation authorities. Current methods in Operational Risk Measurement involve hardly any techniques different to Maximum Likelihood estimation which can be misleading and unreliable. The concepts of robust statistics are used to identify and overcome the main pitfalls of the Maximum Likelihood estimator in the typical Operational Risk severity distributions such as Generalized Pareto Distribution and Lognormal Distribution.

#5: **Rank tests in linear models with measurement errors**

Presenter: Jana Jureckova@Charles University in Prague, Czech Republic
Co-authors: Jan Picek, A.K.Md. Ehsanes Saleh

The rank and regression rank score tests of linear hypothesis in the linear regression model can be modified for some measurement error models in such a way that the modified tests are still distribution free, there is only some loss of efficiency. Under some types of errors we even do not need to estimate the nuisance parameters. The loss in the asymptotic relative efficiency of the tests with respect to tests in models without errors is evaluated. The power of the modified tests is illustrated on simulated data.

#36: **An algorithm for LARS and LASSO based on S-estimators**

Presenter: Claudio Agostinelli@"Ca Foscari" University of Venice, Italy
Co-authors: Matias Salibian Barrera

Several methods for model selection based on penalized variants of well known criteria have been recently discussed in the literature. These include the LASSO and the LARS methods. The LASSO approach minimizes the sum of residual squares, with a bound on the L1-norm of the regression coefficients. It is related to soft-thresholding of wavelet coefficients, forward stage-wise regression, and boosting methods. The LARS is a less greedy version of traditional forward selection methods which can also be efficiently computed. A simple algorithm is available to find the complete path of solutions of LARS. Furthermore, a simple modification of this algorithm finds all solutions of LASSO as a function of the L1-constraint. We introduce robust versions of the LARS and LASSO procedures based on S-estimators for regression. In particular, we describe an algorithm to compute the solutions of this robust LARS, and show that a modification of it also allows us to compute the solutions of the robust LASSO. These algorithms are computationally efficient and suitable even when the number of variables exceeds the sample size. Both theoretical results and applications to real datasets are reported.

#16: **Tools for local multivariate outlier detection**

Presenter: Peter Filzmoser@Vienna University of Technology, Austria
Co-authors: Anne Ruiz-Gazen, Christine Thomas

Various outlier detection methods for multivariate data are available. Most of them are based on a robust estimation of the Mahalanobis distance. Here we consider the case that spatial coordinates are available for the observations. As a measure of similarity between the observations we consider the pairwise Mahalanobis distances. The theoretical distribution is derived, and the result is used for evaluating the degree of isolation of each observation. Different exploratory tools are introduced for studying the isolatedness of an observation from a fraction of its neighbors, and thus local multivariate outliers can be identified.

ES05 Room: B104 SMALL AREA ESTIMATION Chair: Domingo Morales

#18: **An unit level model with fixed or random domain effects in small area estimation problems**

Presenter: Tomas Hobza@CVUT FJFI, Czech Republic
Co-authors: Montserrat Herrador, Maria Dolores Esteban, Domingo Morales

We introduce a nested regression model having both fixed and random effects to estimate linear parameters of small areas. The model is applicable to data having a proportion of domains where the variable of interest cannot be described by a standard linear mixed model. Algorithms and formulas to fit the model, to calculate EBLUP and to estimate mean squared errors are described. To illustrate the gain of precision obtained by using the proposed model a Monte Carlo simulation experiment is presented. A motivating application to Spanish Labour Force Survey data is also given.

#79: **Spline smoothing in small area estimation**

Presenter: Maria Dolores Ugarte@Puplic University of Navarra, Spain
Co-authors: Tomas Goicoa, Ana F. Militino

Small area estimation techniques have experienced a quick evolution in the last few years motivated by the necessity of precise information for small domains. Different models have been investigated to build new model-based estimators and researchers have come across new problems related to the estimation of the MSE. The main objective of this work is to predict future values of a

response variable within small areas. A semiparametric model is proposed combining a non-parametric time trend and a specific random effect for each region. Penalized splines and their representation as a mixed effect model are used. The MSE estimator of the predictor of both observed data and future observations is also derived. This estimator takes account of the uncertainty due to the estimation of the variance components and the variability of the particular observations. The procedure is illustrated with a real data set consisting of dwelling average prices (per squared meter) for nine neighborhoods in the city of Vitoria, Spain, in the period 1993-2007. Predictions of the evolution of dwelling average prices (per square meter) for the next five years are provided together with their mean squared prediction errors.

#115: **Bootstrap estimation of the mean squared error under a Spatial Fay-Herriot model**

Presenter: ..... Isabel Molina@Universidad Carlos III de Madrid, Spain
Co-authors: ..... Nicola Salvati, Monica Pratesi

This work deals with small area estimation under a Fay-Herriot model with random area effects following a Simultaneously Autoregressive (SAR) process. Under this model, parametric and nonparametric bootstrap procedures are proposed for estimating the mean squared error of the Spatial EBLUP. A simulation study based on real data from the Italian Agricultural Census 2000 compares the bootstrap estimators with some alternative analytical estimators and studies the robustness of all these estimators to non-normality. Results show a better bias performance of the nonparametric bootstrap when data come from a skew distribution (Gumbel) or from a distribution with heavy tails (Student t with 6 degrees of freedom). Results also suggest that, under normality, this bootstrap method is comparable to the analytical estimates and the parametric bootstrap.

#116: **Borrowing strength over space in small area estimation using M-quantile geographically weighted models**

Presenter: ..... Nikos Tzavidis@University of Manchester, UK
Co-authors: ..... Nicola Salvati

One popular approach to small area estimation when data are spatially correlated is to employ Simultaneous Autoregressive Regression (SAR) random effects models to define an extension to the Empirical Best Linear Unbiased Predictor (EBLUP) namely, the Spatial EBLUP. SAR models allow for spatial correlation in the error structure. An alternative approach for incorporating the spatial information in the regression model is via Geographically Weighted Regression (GWR). GWR extends the traditional regression model by allowing local rather than global parameters to be estimated. We investigate the use of GWR in small area estimation based on the M-quantile modeling approach. In doing so we first propose an extension to conventional GWR namely, M-quantile GWR. This is a local, outlier robust, model for the M-quantiles of the conditional distribution of the outcome variable given the covariates. This model is then utilized for defining a predictor of the small area characteristic of interest that accounts for the spatial structure in the data. An important spin-off from this approach is efficient synthetic estimation for out of sample areas. Mean squared estimation for the M-quantile GWR small area parameters is presented. We demonstrate the usefulness of this framework through model and design-based simulations. The effect of different types of geo-referenced information on small area estimation is assessed using environmental and economic survey data that contain different levels of geographical detail.

ES13 Room: B013 MIXTURE MODELS AND CLUSTERING Chair: Christian Hennig

#42: **From clustering to mixture models.**

Presenter: ..... Agustin Mayo-Iscar@Universidad de Valladolid, Spain
Co-authors: ..... Juan A. Cuesta-Albertos, Carlos Matran-Bea

Often clustering techniques are based on the methods of estimation in mixture models. Recently we have introduced a methodology based just in the opposite point of view through a two-step estimation procedure. First we resort to a clustering method, the trimmed k-means with a high trimming level, to achieve the central part of the multivariate Normal distributions that compose the mixture. Then we use Maximum Likelihood Estimation based on the non-trimmed data to estimate the parameters in the mixture. The resulting estimator is consistent and asymptotically normal and keeps a nice behavior in presence of anomalous data. Through this work we will discuss on the performance of the methodology and address some improvements making use of new clustering techniques and suitable estimators.

#29: **Local depth**

Presenter: ..... Mario Romanazzi@"Ca Foscari" University of Venice, Italy
Co-authors: ..... Claudio Agostinelli

Data depth is a distribution-free statistical methodology for graphical/analytical investigation of data sets. The main applications are a center-outward ordering of multivariate observations, location estimators and some graphical presentations (scale curve, DD-plot). By definition, depth functions provide a measure of centralness which is monotonically decreasing along any given ray from the deepest point. This implies that any depth function is unable to account for multimodality and mixture distributions. To overcome this problem we introduce the notion of Local Depth which generalizes the concept of depth. The Local Depth evaluates the centrality of a point conditional on a bounded neighborhood. For example, the local version of simplicial depth is the ordinary simplicial depth, conditional on random simplices whose volume is not greater than a prescribed threshold. These generalized depth functions are able to record local fluctuations of the density function and are very useful in mode detection, identification of the components in a mixture model and in the definition of "nonparametric" distances in cluster analysis. We provide theoretical results on the behavior of the Local Depth and illustrate its use in cluster analysis. Finally, we discuss some computational problems involved in the evaluation of the Local Depth.

#109: **The robust improper ML estimate for finite location-scale mixtures and how to choose the improper density**

Presenter: Pietro Coretto@University of Salerno, Italy
Co-authors: Christian Hennig

Maximum likelihood (ML) for finite location-scale mixtures is not robust against outliers. We consider a robust alternative to the ML method. In particular we will concentrate on an estimator which is the maximizer of an improper likelihood function. The latter is obtained adding an improper constant density to a mixture density from a location-scale family. The choice of the improper density is crucial, and here we discuss several alternatives. We also illustrate an application where our method is used to classify financial assets based on their measured risk.

#117: **Mixture models, clustering and covariates**

Presenter: Claire Gormley@UCL, UK
Co-authors: T.B. Murphy

The mixture modelling framework is well established as a statistical approach to clustering a set of heterogeneous observations. A mixture of experts model builds on the structure of mixture models by taking account of both observations and associated covariates. The manner in which covariates influence the clustering structure is of interest. Covariates may influence the mixing proportions of the mixture model, or influence the cluster densities, or perhaps influence both. A comparison of such models is proposed to provide deeper insight to clustering structure. A mixture of experts model is developed for the case in which the observed data is rank data. As an illustrative example, voters in Irish elections are clustered to uncover voting blocs, i.e. clusters of voters with similar voting preferences. Irish voters provide a suitable example as Irish elections employ an electoral system in which voters rank, in order of preference, some or all of the electoral candidates. Both the rank votes cast and the voter covariates are modelled. Interest lies in highlighting voting blocs in the Irish electorate. Additionally the manner in which covariate social factors influence the clustering structure is of interest. Data from an Irish presidential opinion poll are analyzed.

#61: **How to join normal mixture components**

Presenter: Christian Hennig@UCL, UK

The normal mixture model is often used for cluster analysis. Usually every mixture component is identified as a cluster. However, this is not always justified. Different normal mixture components are not necessarily well separated from each other and their mixture (being then a sub-mixture of the mixture modelling the whole dataset) may even be unimodal. This presentation is about rules to decide whether two or more components of a normal mixture should be joined to be considered as a single cluster. This is not a purely statistical estimation problem, because it depends on what kind of clusters the user wants to obtain, which particularly means how separated they are required to be. There is some previous work on *multilayer mixtures*, but this sidesteps the issue of deciding about an appropriate cluster concept by fixing the number of clusters. I will discuss new approaches based on gap statistic, ridgeline and the Bhattacharyya distance.

CS07 Room: AUM GRAPH BASED MODELLING Chair: Marco Reale

#21: **Regression trees for regime changes analysis**

Presenter: Carmela Cappelli@University of Naples, Italy
Co-authors: Francesca Di Iorio

The detection of structural changes in time series is an active area of research. The most challenging task is to identify multiple breaks occurring at unknown date and most contributions have addressed the case of level shifts. Within this context a computational efficient procedure called ART that employs regression trees to identify the breaks in the mean and their locations have recently been proposed. This paper focuses on the detection of regime changes due to instability in model parameters. To this aim we propose an extension of the ART procedure that uses in the tree growing stage the residuals of models fitted to contiguous subseries obtained by splitting the original series. Thus, if T is the length of the series for each value of k with $min_{obs} \leq k \leq T - min_{obs}$ (min_{obs} denotes a minimum number of observations needed to estimate the model) two separate models are estimated and the corresponding residuals computed. The best split is the one that maximizes the reduction in the residuals when splitting a node into its offsprings. The location of the splits provides the dates at which the regime change occurred. For the purpose to select of the final number of breaks the Chow test can be employed: splitting stops if the achieved reduction does not ensure the chosen significance level. Eventually, in order to circumvent the problem of model mispecification, in our programme various models can be assumed growing candidate trees (i.e., sets of breaks). The performance of the proposed approach is evaluated by means of a simulation study. An application to the US labor productivity index is also presented and discussed.

#120: **Assessing the effect of debit cards on households' spending under the unconfoundedness assumption**

Presenter: Andrea Mercatanti@Bank of Italy, Italy

The paper proposes an application of some causal inference methods for the purpose of evaluating the effect of the use of debit cards on households' consumptions. Motivated by the evidence that debit card users overspend in comparison to non-users, the analysis investigate the existence of a causal relationship rather than a mere association. The available dataset allows us to introduce a set of pre-treatment variables so that the unconfoundedness assumption can be adopted. This gives the advantage of avoiding the introduction of assumptions on the link between the observable and unobservable quantities, and it also improves the precision in comparison to other main methodological options. The analysis results in positive effects on a household's monthly spending; it

also provides a comparative application of various causal methods to a real dataset.

#238: **Graphical models of multivariate volatility**

Presenter: Alethea Rea@University of Canterbury, New Zealand
Co-authors: Marco Reale, Carl Scarrott

In order to understand volatility transmission between financial assets a multivariate model is essential. This paper looks at using graphical modelling to study volatility transmission. Graphical modelling is a technique that objectively tests all potential influences on an index from its own past and other indices. The influences of the other indices can be contemporaneous. The results of graphical modelling are compared to the standard econometric tool for measuring multivariate volatility, the multivariate BEKK-GARCH model. The data used for this investigation is the daily closes of the Standard and Poor's 500 Composite Index (S&P 500), FTSE 100 and Nikkei 225. The period of investigation is from 3 April 2001 to 31 March 2005. The three stock indices are widely followed and over a 24 hour period and there is little overlap in trading hours. The Dickey-Fuller and Phillips-Perron tests confirm that for all three series that the log returns are first order stationary and the index prices are not stationary in mean.

#242: **A test for H self-similarity**

Presenter: Marco Reale@University of Canterbury, New Zealand
Co-authors: William Rea, Les Oxley, Chris Price

It is now recognised that long memory and structural change can be confused because the statistical properties of times series of lengths typical of financial and econometric series are similar for both models. We propose a new test of methods aimed distinguishing between unifractal long memory and structural change. The approach, which utilises the computational efficient methods based upon Atheoretical Regression Trees (ART), establishes through simulation the bivariate distribution of the fractional integration parameter, d, with regime length for simulated fractionally integrated series. This bivariate distribution is then used to empirically construct a test. We apply these methods to the realized volatility series of 16 stocks in the Dow Jones Industrial Average. We show that in these series the value of the fractional integration parameter is not constant with time. The mathematical consequence of this is that the defition of H self-similarity is violated. We present evidence that these series have structural breaks.

CS16 Room: ALG NUMERICAL METHODS IN ECONOMETRICS Chair: Ioannis C. Demetriou

#177: **A linearly distributed-lag estimator with r-convex coefficients**

Presenter: Evangelos Vassiliou@University of Athens, Greece
Co-authors: Ioannis Demetriou

The purpose of linearly distributed-lag models is to estimate, from time series data, values of the dependent variable by incorporating prior information of the independent variable. Over the years, literature agrees that some weak representation of the lag coefficients is a sensible requirement for a satisfactory model estimation. A least squares calculation is proposed for estimating the lag coefficients subject to the condition that the divided differences of order r of the coefficients are nonnegative, where r is a prescribed positive integer. Such priors not only do not assume any parameterization of the coefficients, but in several cases provide an accurate representation of the prior knowledge and compare favourably to established methods, as, for instance, those of Almon, Shiller and Solow. In particular, the choice of the prior knowledge parameter r gives the time series estimation valuable flexibility. The estimation problem is a strictly convex quadratic programming calculation, where each of the constraint functions depends on r+1 adjacent lag coefficients multiplied by the binomial numbers with alternating signs that arise in the expansion of the r-th power of (1-1). The most distinctive feature of this calculation is the Toeplitz structure of the constraint coefficient matrix, which allows the development of a special active set method that is more efficient than general quadratic programming algorithms. Most of this efficiency is due to reducing the equality-constrained minimization calculations, which occur during the quadratic programming iterations, to unconstrained minimization ones that depend on much fewer variables. Some examples with real data are presented in order to illustrate this approach.

#119: **A study of total investor wealth for investors in the Athens stock exchange**

Presenter: Yiannis Bassiakos@University of Athens, Greece

In the present work, a comparison of the aggregated wealth between various groups of investors in the Athens Stock Exchange is presented. The period studied is from September 1999 to June 2003. This period is divided into a segment of rapid decline, followed by a segment of prolonged stagnation. The objective of the study was to identify groups of investors with differing patterns of gains or losses. The main method of analysis was repeated measures ANOVA with dependent variable the aggregated wealth, defined as the total value of stocks held by any particular investor plus the cash available to him either resulting from stock sales or coming from any other source. The results confirm the observation made worldwide i.e. that investors of high aggregated wealth or/and high frequency of transactions suffer greater losses in periods of market decline and uncertainty, as the one studied herein.

#76: **Exact optimal and adaptive inference in linear and nonlinear models**

Presenter: Abderrahim Taamouti@Universidad Carlos III de Madrid, Spain
Co-authors: Jean-Marie Dufour

In this paper we derive simple sign-based point-optimal test in linear and nonlinear regression models. The test is exact, distribution

free, robust against heteroskedasticity of unknown form, and it may be inverted to obtain confidence regions for the vector of unknown parameters. Because our optimal test depends on the alternative hypothesis, we propose an adaptive approach based on sample-split technique to choose an alternative such that the power curve of point-optimal sign test is close to the power envelope curve. The simulation study shows that when using approximately 10% of sample to estimate the alternative and the rest to calculate the test statistic, the power curve of the point-optimal sign test is typically close to the power envelope curve. We present a Monte Carlo study to assess the performance of the proposed quasi-point-optimal sign test by comparing its size and power to those of some common tests which are supposed to be robust against heteroskedasticity. The results show that our procedure is superior.

#156: **An ad hoc inexact Newton method for model simulation.**

Presenter: . . . . . Claudia Miani@Bank of Italy, Italy
Co-authors: . . . . . Stefania Bellavia

This paper is concerned about improving the efficiency and the robustness of computing the solution of large-scale macroeconometric models. We know that the resulting systems are large and sparse (and structured if the model contains forward-looking variables). The Nonstationary Iterative methods are well suited for the computation of the Newton step. We present a Newton-GMRES method with enhancements due to : an ad hoc preconditioner, a technique of looser residuals, and a strategy of globalization (line search method with Armijo rule). Our numerical experiments confirms the interesting features of our technique. Furthermore, when we do not have good starting value (or in case of severe shocks) we switch to a Newton method with a sparse LU factorization and a trust-region strategy supported by a dynamic control of the iterations and constraints on variables (to guarantee the convergence in case of particularly severe shocks, for example).

#167: **The least sum of absolute change to univariate data that gives convexity**

Presenter: . . . . . Ioannis Demetriou@University of Athens, Greece
Co-authors: . . . . . Sotirios Papakonstantinou

Convexity has useful applications in many fields, as for instance in estimating a utility function that is represented by a finite number of observations. Here, convexity enters by the assumption of non-decreasing returns of utility functions. In general, if plotted values of measurements of function values show some gross errors and away from them the function seems to be convex, then the least sum of absolute change to the data that provides nonnegative second divided differences may be required. This problem is a highly structured constrained L1 approximation calculation, which can be transformed to a linear programming problem, but it would be very inefficient to resort upon general linear programming solvers. Due to establishing necessary and sufficient characterization conditions, an iterative, descent, feasible point, active set algorithm is proposed for this calculation that is proved to terminate to a solution. The algorithm is efficient, because the iterates are derived efficiently from banded matrices, owed to the necessary conditions and the interplay of active constraints and interpolation conditions that occur in L1 calculations. Some numerical results illustrate the method.

CS32 Room: B217 STOCHASTIC VOLATILITY MODELS Chair: Gianna Figa-Talamanca

#186: **Characteristic function estimation of stochastic volatility model**

Presenter: . . . . . Emanuele Taufer@University of Trento, Italy
Co-authors: . . . . . Marco Bee

An asset return process with drift, risk premium and stochastic conditional volatility is considered. The volatility process is modelled as a non-negative stochastic Ornstein-Uhlenbeck (OU) process independent of the driving Brownian motion, it has no Gaussian component, moves entirely by jumps and decays exponentially between two jumps. The asset return process remains continuous. These models were introduced in the literature with the aim of modelling stylized features of financial markets while maintaining analytical tractability. By an appropriate design of the stochastic volatility process one can allow aggregate returns to be heavy-tailed, skewed and exhibit volatility clustering. Estimating the parameters of a continuous stochastic volatility model is difficult owing to the inability to compute the appropriate likelihood function. Model-based estimation approaches are based on MCMC methods. Alternatively one might consider non-model-based estimation approaches which exploit realized volatility, i.e. use the existence of high-frequency data to estimate moments of integrated volatility. In this paper estimation based on the characteristic function of the process is considered. After obtaining closed form solutions for the relevant quantities, the applicability and validity of these techniques is shown by way of simulations. The cases of super-positions of OU processes and presence of leverage are also considered.

#145: **The Taylor effect: a new tool for model adequacy in stochastic volatility models**

Presenter: . . . . . Ana Perez Espartero@University of Valladolid, Spain
Co-authors: . . . . . Esther Ruiz Ortega

It is often observed that the sample autocorrelations of powers of absolute financial returns are larger when the power parameter is around one. This property, known as Taylor effect, is analysed in this paper in the context of Stochastic Volatility (SV) models. We show that these models, either with short or long-memory, can both represent the Taylor property for realistic parameter specifications. We also show that the sample and theoretical autocorrelations of power transformations implied by SV models peak at the same power parameter value. Therefore, the Taylor property is not a sampling phenomena. Based upon this result,

we propose to use the maximum power parameter value as an additional tool for model adequacy. We study the finite sample distribution of this new statistic and compare it with its asymptotic counterpart. All the results are illustrated with real financial series. The effect of outliers on the empirical results are also analyzed.

#236: **Path properties of simulation schemes for continuous stochastic volatility models**

Presenter: Gianna Figa-Talamanca@University of Perugia, Italy

In the last few years a renewed attention has been devoted to Heston stochastic volatility (SV) model which provide a quasi closed pricing formula for European options. Since the traditional Eulero-Maruyama and Milstein schemes fail in the SV framework, new simulations schemes have been recently suggested for Heston model. These new methods have been compared in a subsequent paper with the standard Eulero-Maruyama discretization scheme where different *fixes* are used to retain the positivity of the discretized variance; the performance is evaluated with the distance between model and Monte Carlo European option prices which depends only on the simulated terminal value of the underlying. However, path properties of simulated data become relevant for pricing path dependent exotic derivatives and for doing inference on model parameters applying the Simulated Likelihood or the Indirect Inference estimation methods as recently suggested for SV models. The aim of this analysis is to investigate the performance of a simulation scheme in reproducing the theoretical serial dependence of the model; to this end we apply the results obtained in a previous paper concerning the autocovariance and autocorrelation functions of the mean variance. A formal test is also introduced to compare the performance of the schemes.

#223: **Likelihood-based inference for stochastic volatility models using asset and option prices**

Presenter: Konstantinos Kalogeropoulos@Cambridge, UK

Stochastic volatility models are often used to describe the evolution of asset prices and formulate valuations of their derivatives. There is a duality relationship between derivative pricing and statistical inference: Estimates of the real world measure parameters may aid in constructing pricing formulae. On the other hand, the information contained in observed derivative prices, such as options, can be used for inference purposes. This paper focuses on the estimation problem and also discusses its link with the option pricing. Inference is based in both asset and option prices, aiming in estimates of increased efficiency and in a more realistic market representation. The paper presents a general inferential scheme, via Markov Chain Monte Carlo techniques, that may be used to carry out likelihood-based inference under different observation regimes. Furthermore, the Bayesian framework provides a natural way of incorporating parameter and model uncertainty in the pricing procedure. The methodology is illustrated and tested through simulations and data from the S&P 500 Index and its implied volatility, VIX.

CS47 Room: E003 INTEGER VALUED TIME SERIES AND RELATED TOPICS - 2 Chair: Konstantinos Fokianos

#169: **Outlier estimation and detection for INGARCH processes**

Presenter: Roland Fried@TU Dortmund, Germany

Integer-valued GARCH processes for dependent integer-valued data are extended to include the effects of explanatory variables. In particular, this approach is useful for modelling and detecting several types of outliers in time series of counts. Standard definitions of time series outliers like (transient) level shifts and additive outliers are extended to this model family in a natural way. Computationally tractable methods for outlier detection and identification are derived using score tests, whose critical values in finite samples are determined in simulations. Joint estimation of outlier effects and model parameters is performed by conditional maximum likelihood estimation. The usefulness of the proposed methods is illustrated using simulated and real examples.

#32: **Integer-valued model miming classical econometric models**

Presenter: Alain Latour@UPMF / UQAM, France
Co-authors: Lionel Truquet

Econometric time series model can be defined to describe integer-valued observations. We present an integer-valued GARCH type model and two bilinear type models. The latter one, which can be useful in a context of inventory management or epidemiology, is based on a thinning operator allowing for negative values. We establish the existence of such a processes.The estimation of the parameters is tackled with the help of different methods: conditional likelihood and quasi-maximum likelihood. We give some asymptotic results for these estimators. Numerical examples and applications from social medicine are presented.

#104: **Ordinal stochastic volatility and stochastic volatility models for price changes: an empirical comparison**

Presenter: Claudia Czado@Technische Universitaet Muenchen, Germany
Co-authors: Thi-Ngoc-Giau Nguyen, Gernot Mueller

Modelling price changes in financial markets is a challenging task especially when models have to account for salient features such as fat tail distributions and volatility clustering. An additional difficulty is to allow for the discreteness of price changes. These are still present after the US market graduation to decimalization. Recently we introduced the class of ordinal stochastic volatility (OSV) models, which utilizes the advantages of stochastic volatility (SV) models, while adjusting for the discreteness of the price changes. OSV models are based on a threshold approach, where the hidden continuous process follows a SV model specification, thus providing a more realistic extension of the ordered probit model. It allows for exogenous variables both on the mean and variance level of the hidden process. Estimation in OSV models using maximum likelihood is not feasible, therefore we follow

a Bayesian approach using Markov Chain Monte Carlo (MCMC) methods for estimation. This paper explores the applicability of the OSV model to financial stocks with different levels of trading activity. Especially, we investigate which exogenous factors such as volume, daytime, time elapsed between trades and the number of quotes between trades have influenence on the mean and variance level of the hidden process and thus on the discrete price changes. A second focus of this paper is the comparison of OSV and SV model specifications to assess how large the gain of the OSV is over the SV model.

#108: **Nonlinear time series clustering based on nonparametric forecast densities**

Presenter: ..... Jose A. Vilar-Fernandez@University of Coruna, Spain
Co-authors: ..... Andres M. Alonso, Juan M. Vilar-Fernandez

Time series clustering is a central problem to many application fields and hence this topic is nowadays an active research area in different disciplines including signal processing, finance and economics, medicine, seismology, meteorology and pattern recognition, among others. We introduce a new clustering procedure to deal with a general class of autoregressive processes, including both linear and nonlinear time series. Specifically, our clustering procedure proceed as follows. First, a particular criterion of dissimilarity between two time series objects is adopted. The concept of dissimilarity between two time series is not simple and, in fact, besides conventional metrics as the Euclidean distance or the Fr'echet distance, other dissimilarity criteria specifically designed to deal with time series have been proposed in the literature. We compute the dissimilarity between two time series in terms of the discrepancy between their forecast densities at a specific future time. Hence, our cluster solution is governed by the behaviour of the predictions at a prefixed horizon. Since the forecast densities are unknown, we approximate them using kernel-type density estimates based on bootstrap predictions. We consider a resampling technique, so-called autoregression bootstrap, based on mimicking the nonparametric dependence structure of the underlying processes. Actually autoregression bootstrap works in a similar approach to residual-based resampling of linear autorregresions, but it takes advantage of being free of the linearity requirement and hence it can be applied to our general class of nonparametric models. In this point, we can construct a dissimilarity matrix using the abovementioned criterion but replacing the unknown forecast densities by the estimated ones. Lastly, we perform an agglomerative hierarchical clustering process using a standard cluster algorithm. In the paper, the consistency of the bootstrap distances computed in stage 3 is established. The proof of this result is based on the validity of the autoregression bootstrap, the uniform almost sure convergence of the nonparametric forecasting and some standard results from nonparametric density estimation theory. Results from an extensive simulation study illustrate the good performance of the proposed procedure to classify both linear and nonlinear autoregressive processes. Furthermore, the method also works well with non-Gaussian innovations. Finally, our clustering procedure is used to classify a set of European countries on basis of their industrial production indices series for capital goods.

#94: **On comparing several spectral densities**

Presenter: ..... Konstantinos Fokianos@University of Cyprus, Cyprus

We are investigating the problem of testing equality among spectral densities of several independent stationary processes. The main methodological contribution is the introduction of a novel semiparametric loglinear model which links all the spectral densities under consideration. This model is motivated by the asymptotic properties of the periodogram ordinates and it specifies that the logarithmic ratio of (G-1) spectral density functions with respect to the G'th is linear in some parameters. Subsequently the problem of testing equality of several spectral density functions is reduced to a parametric problem. Under this assumption, the large sample theory of maximum likelihood estimator is studied and it is shown that the estimator is asymptotically normal even if the model is misspecified. The development of the asymptotic theory is based on a new contrast function which might be useful for other spectral domain time series problems. The results are applicable to a variety of models including linear and nonlinear processes. Simulations and data analysis support further the theoretical findings.

Saturday 21.06.2008 09:00-11:00 Parallel Session I

ES04 Room: GB1 DEPTH AND TRIMMING IN ROBUSTNESS Chair: Alfonso Gordaliza

#88: **Depth functions and random convex hulls**

Presenter: Ignacio Cascos@Universidad Carlos III de Madrid, Spain

Given a random vector X in the multivariate Euclidean space, consider the sequence of random sets whose n-th element is the convex hull of n independent copies of X. We will use this sequence of random sets to measure the degree of centrality (depth) of any given fixed point with respect to the distribution of X. In particular, we will study the set-valued expectations of such random sets and their coverage functions (the probability that a given fixed point lies inside the random set). The sequence of set-valued expectations constitute a family of central regions with respect to the distribution of the random vector, and the average number of independent copies of the random vector that are needed so that a fixed point lies inside their convex hull can be used to measure the centrality of the fixed point with respect to its distribution. Some properties of the expectation of the convex hull of n independent copies of X that make it appropriate to assess the financial risk of a vector portfolio modeled as X will be briefly commented.

#90: **Depth for sparse functional data**

Presenter: Sara Lopez-Pintado@Universidad Pablo de Olavide de Sevilla, Spain
Co-authors: Ying Wei

The analysis of functional data is a modern area of research in statistics. Recently, new notions of depth for functional data with desirable properties have been proposed. Functional depth provides a rigorous way of ordering curves from center outward. Using these concepts we can extend the classical order related statistics to functional data. A depth-based rank test is introduced to check whether two groups of curves come from the same population. The existing methods for estimating the depth are designed for curves observed on an evenly spaced and sufficiently fine grid. We are interested in applying these methods to a real growth data set from children who were born in the U.S. in 1988. Their heights and weights were taken sporadically only when they visited a hospital. Consequently, their growth paths were recorded on a set of sparse and irregularly-spaced time points and the number of measurements per subject is small. We propose a method to estimate the depth for such sparse and irregularly-spaced curves by a two step approach. First, we estimate the conditional distribution of the underlying growth path given the observed measurements. Second, we estimate the depths through conditional expectations.

#94: **Assessing when a sample is mostly normal**

Presenter: Pedro Cesar Alvarez-Esteban@University of Valladolid, Spain
Co-authors: Eustasio del Barrio, Juan A. Cuesta-Albertos, Carlos Matran

Data-driven trimming methods in the goodness of fit framework have been recently introduced by the authors as a way not only to robustify these statistical procedures but also as a method to discard a part of the data to achieve the best possible fit between a sample and a theoretical distribution or between two given samples. In this work we present a new methodology based on trimming a variable proportion of observations in each tail of a univariate distribution. Instead of the classical symmetric trimming procedure we present a proposal in which the data itself determines the proportion of observations to be trimmed at each tail. We will introduce the main ideas concerning this way of trimming, as a previous step to a more generalized way of trimming, presenting the asymptotic results which allow the use of these methods to assess the normality of a sample as well as some algorithms and examples to illustrate the methodology.

#81: **Robust clusterwise linear regression**

Presenter: Alfonso Gordaliza@Universidad de Valladolid, Spain
Co-authors: Luis Angel Garcia-Escudero, Agustin Mayo-Iscar, Roberto San Martin

The presence of clusters in a data set is sometimes due to the existence of certain relationships among the measured variables and, thus, observations could be grouped in a natural way around linear and nonlinear structures. The problem of performing robust clustering around linear affine subspaces has recently been tackled by minimizing a trimmed sum of orthogonal residuals. The orthogonal choice implies that no privileged response or output variable is taken into account. However, there are problems where clearly one variable may be assumed to be explained in terms of the other ones and the use of classical linear regression residuals seems to be more advisable. Here, we extend the so-called TCLUST methodology to perform robust clusterwise linear regression. A feasible algorithm for doing this task will be introduced which includes a second trimming aimed to diminish the effect of some leverage points that (although they do not break down the procedure) entail considerable biases in the determination of the underlying linear structures. This second trimming is also convenient in order to avoid classification errors that sometimes occur due to the artificial elongation of the zones of influence of the groups.

ES10 Room: B104 SPATIAL AND TEMPORAL COMPUTATIONAL STATISTICS Chair: Peter Congdon

#77: **Spatial logistic regression based upon contiguity concept**

Presenter: Ahmed Bounekkar@Universite Lyon 1, France

Logistic regression is a statistical method used for prediction of the probability of occurrence of an event (binary variable). The predictor variables may be either numerical or categories. This method does not take into account the effect of an observation on another in the spatial areas. In this paper, we will introduce at first the concept of contiguity between observations in the spatial domain. The use of a coefficient of contiguity requires the intervention of a good indicator of distance between these observations. We based the definition of the contiguity between obseravtions on the concept of distance, but another choice of proximity can be used. We then will propose a spatial method of logistic regression where each coefficient of the model is a function of the coefficient of contiguity between the predictive variable and the outcome. Our model then takes the form Pr=E(Yr/Ys) Where Yr is a dichotomous outcome measured upon area r. The logit of Pr is a linear combination of Ys balanced by the coefficients of contiguity. These observations define a set of neighbor areas of r. After presentation of this model, the unknown parameters are estimated by maximum likelihood. In the absence of a method giving an explicit expression of these parameters, the maximization of the likelihood function will be based on a stepwise algorithm: we suggest a suboptimal method which consists in discretizing the space of the parameters, then compute the likelihood for each set of values. That model is applied to study the state of health of the population in the Ile-de-France region and their level of exposure to various agents stressors (important duration of transport, noise, painful work conditions, etc.).

#12: **Bootstrap based bandwidth choice for log-periodogram regression**

Presenter: Josu Arteche@University of the Basque Country, Spain
Co-authors: Jesus Orbe

The choice of the bandwidth in the local log-periodogram regression is of crucial importance for estimation of the memory parameter of a long memory time series. Different choices may give rise to completely different estimates, which may lead to contradictory conclusions, for example about the stationarity of the series. We propose here a data driven bandwidth selection strategy that is based on minimizing a bootstrap approximation of the mean squared error and compare its performance with other existing techniques for optimal bandwidth selection in a mean squared error sense, revealing its better performance in a wider class of models. In particular, we use a local bootstrap based in the log periodogram regression context, which is adequate to replicate the structure of the errors. The empirical applicability of the proposed strategy is shown with two examples: the widely analyzed in a long memory context Nile river annual minimum levels and the input gas rate series of Box and Jenkins.

#63: **Computing functional estimators of the long-range dependence parameters in the spectral-wavelet domain**

Presenter: Maria del Pilar Frias Bustamante@University of Jaen, Spain
Co-authors: Maria Dolores Ruiz-Medina

For semiparametric functional estimation of the long-range dependence parameter, we exploit the equivalence between the behavior of the covariance tails and the regularity at zero of its Fourier transform. The class of models considered is defined in terms of a separable spatiotemporal Riesz kernel convoluted with a second-order spatiotemporal process satisfying suitable regularity and moment conditions. Given the double singularity of the Riesz kernel in the spatio-temporal and spectral domain, efficient estimation methods of the long-range dependence spatial and temporal parameters, defining its local singularity and heavy-tail behavior, are difficult to design. In this paper, we propose estimators of such parameters based on the wavelet transform of the spectral functional data, given by the Fourier transformation of the realizations observed of the spatiotemporal process of interest. Specifically, linear regression is applied to the log-directional wavelet transform of the spectral functional data. Two computational methods are proposed respectively based on the directional smoothing of the functional spectral data, and on the average of directional estimators obtained without previous smoothing. A simulation study is performed to investigate the stability of the computational methods proposed for functional parameter estimation. Additionally, in this simulation study the bias and variability properties of the estimators proposed are studied. The results derived extend to the functional and wavelet domain context of recently obtained results.

#92: **Efficient algorithms for estimating the error-components seemingly unrelated regression model with serrialy correlated disturbances**

Presenter: Petko Yanev@University of Neuchatel, Switzerland
Co-authors: Paolo Foschi, Erricos John Kontoghiorghes

Numerical strategies for computing the error components regression model as a special case of the standard general linear model are considered. Specifically, an efficient generalized linear least squares approach for fast estimation of the error components model is presented, where various distributions of the error terms are investigated. Computationally efficient and numerically stable strategies for estimating the resulting models are proposed, which provide numerical solutions for computing the error components model with serially correlated time effects and/or idiosyncratic errors. The new algorithms are based on fast numerical strategies for computing the QR decompositions of sparse and structured matrices and are rich on BLAS 3 computations. The proposed algorithms are further extended to compute the estimation of the seemingly unrelated regression model with two-way error component disturbances. Several special cases with various assumptions imposed on the covariance matrices of the time effects and the idiosyncratic errors are considered. The properties of the extended algorithms are evaluated and discussed. Numerical

results are presented and the efficiencies of the proposed algorithms are analyzed.

ES12 Room: B013 SWITCHES AND STRUCTURAL BREAKS IN A BAYESIAN FRAMEWORK Chair: Gianni Amisano

#100: **Detecting structural breaks in multivariate financial time series: evidence from hedge fund investment strategies**

Presenter: Ioannis Vrontos@Athens University of Economics and Business, Greece
Co-authors: Loukia Meligkotsidou

This paper extends the class of asset-based style factor models with multiple structural breaks to the multivariate setting. We propose a model that allows for the presence of common breaks in a system of factor models for individual hedge fund investment strategies, which share common investment characteristics. We develop a Bayesian approach to inference for the unknown number and positions of the structural breaks, based on a set of filtering recursions similar to those of the forward-backward algorithm. Furthermore, we identify relevant risk factors, common among the series of hedge funds, using a Bayesian model comparison approach. We apply our method to a set of correlated hedge fund strategies, which are mainly characterized by equity related bets. Multiple common breaks are identified, consistent with well-known market events, which reveal evidence for structural changes in the risk exposures as well as in the correlation structure of the analyzed series.

#41: **Identifying business cycle turning points with sequential Monte Carlo**

Presenter: Roberto Casarin@University of Brescia, Italy
Co-authors: Monica Billio

We apply the sequential Monte Carlo (SMC) method to the detection of the turning points in a business cycle. The proposed nonlinear filtering method is very useful for estimating sequentially the latent-factors and the parameters of nonlinear time-series models. In order to illustrate the effectiveness of the methodology, we measure in a full Bayesian and real-time context, the ability of some existing and new Markov-switching models to identify turning points in the European economic activity. We also provide a comparison of our results with the existing analysis and an application to the forecast accuracy evaluation of competing models.

#55: **Forecasting realized volatilities through long memory and switching regime models**

Presenter: Davide Raggi@University of Bologna, Italy
Co-authors: Silvano Bordignon, Silvestro Di Sanzo

It is well known that accurately measuring and forecasting financial volatility plays a central role in many pricing and risk management applications. With high frequency intra-day data becoming widely available more accurate estimates of volatility can be obtained. Some statistical tests suggest the existence of both nonlinear and long-memory components in many economics and financial time series. It appears of interest to jointly model both features into a single time series model. In this way it is also possible to see whether the benefits of combining long memory and nonlinearities will improve accuracy in forecasting volatility. For these reasons, we propose different models that simultaneously capture long memory and nonlinearities in which both level and persistence shift according to a Markov switching process. We use these models to describe the dynamics of the realized volatility of the S&P500 index. MCMC techniques are employed to estimate all the unknown quantities of the model. We adopt a multi-move Gibbs sampler to simulate the state process and a Metropolis-Hastings scheme for the parameters. We compare the models through their forecasting performance. Bayesian predictive densities have been obtained within such an algorithm. In-sample and out-of-sample results evidence the good performance of nonlinear and long-memory models.

#39: **A DSGE model of the term structure with regime shifts**

Presenter: Gianni Amisano@European Central Bank/University of Brescia, Germany/Italy
Co-authors: Oreste Tristani

We analyse the term structure implications of a small DSGE model with nominal rigidities in which the laws of motion of the structural shocks are subject to stochastic regime shifts. We demonstrate that, to a second order approximation, switching regimes generate time-varying risk premia. We estimate the model using sequential Monte Carlo methods and relying on information from both macroeconomic and term structure data. Our preliminary results show support for the model, compared to alternative specifications with constant regimes. The structural nature of the model also allows us to attribute a direct economic interpretation to the regimes and to the regime-dependence of various features of the yield curve.

CS03 Room: ALG FINANCIAL ECONOMETRICS - 2 Chair: Olivier Scaillet

#7: **Quote quality in an order driven market**

Presenter: David Veredas@Universite Libre de Bruxelles, Belgium
Co-authors: Roberto Pascual

This paper proposes a new procedure to measure the quality of ask and bid quotes. Quote quality is defined in two different ways: first, by the proportion of total variance of ask and bid quotes due to informational volatility; second, by the proportion of the correlation between ask and bid quotes explained by the efficient price movements. These measures are computed using the reduced form of a structural price formation model for ask and bid quotes, and applied a sample of common stocks listed in the Spanish Stock Exchange, an electronic order driven market. Our preliminary findings using quotes sampled at 5-minute intervals show that microstructure frictions explain a significant fraction of total variance, ranging from 5% for large caps to 50% for small

caps. As quotes are sampled at lower frequencies, however, quote quality increases. We also report a positive crosssectional relationship between liquidity and quote quality. Finally, we show that quote quality has a regular U-shaped intraday pattern.

#12: **Estimation the wishart affine stochastic correlation model using the characteristic function**

Presenter: Florian Ielpo@Paris 1, France
Co-authors: Jose Da Fonseca, Martino Grasselli

In this paper, we present and discuss the estimation of the Wishart Affine Stochastic Correlation (WASC) model under the historical measure. We review the main estimation possibilities for this continuous time process and provide elements to show that the utilization of empirical characteristic function-based estimates is advisable as this function is exponential affine in the WASC case. We thus propose to use the estimation strategy using a continuum of moment conditions based on the characteristic function. We investigate the behavior of the estimates through Monte Carlo simulations. Then, we present the estimation results obtained using a dataset of equity indexes: SP500, FTSE, DAX and CAC. On the basis of these results, we show that the WASC captures many of the known stylized facts associated with financial markets, including the negative correlation between stock returns and volatility. It also helps reveal interesting patterns in the studied indexes' covariances and their correlation dynamics.

#52: **Contemporaneous aggregation of GARCH models and evaluation of the aggregation bias**

Presenter: Eric Jondeau@University of Lausanne, Switzerland

It is well known that the class of strong (Generalized) AutoRegressive Conditional Heteroskedasticity (or GARCH) processes is not closed under contemporaneous aggregation. This paper provides the dynamics followed by the aggregate process when the individual persistence parameters are drawn from the same (unknown) distribution. Assuming heterogeneity across individual parameters, the dynamics of the aggregate volatility involves additional lags that reflect the moments of the distribution of the individual persistence parameters. Then the paper describes a consistent estimator of the aggregate process, based on nonlinear least squares. A simulation study reveals that this aggregation-corrected estimator performs very well under realistic sets of parameters. Last, this approach is extended to a multi-sector context. This extension is used to evaluate the importance of the aggregation bias. Using size and book-to-market portfolios, I show that the investor is willing to pay one fifth of her expected return to switch from the standard GARCH(1,1) estimator to the aggregation-corrected estimator.

#137: **Efficient estimation of a semiparametric dynamic copula model**

Presenter: Olga Reznikova@Universite Catholique de Louvain, Belgium
Co-authors: Christian Hafner

We propose a new semiparametric dynamic copula model where the marginals are specified as parametric GARCH-type processes, and the dependence parameter of the copula is allowed to change over time in a nonparametric way. A straightforward two-stage estimation method is given by local maximum likelihood for the dependence parameter, conditional on consistent first stage estimates of the marginals. First, we characterize the properties of the estimator in terms of bias and variance and discuss the bandwidth selection problem. We then propose an estimator that attains the semiparametric efficiency bound and demonstrate its superiority through simulations. Finally, we illustrate the wide applicability of the model in financial time series, comparing it also with traditional models based on conditional correlations.

#22: **A semiparametric analysis of the term structure of the US interest rates**

Presenter: Fabrizio Iacone@University of York, UK

The short end of the US term structure of interest rates is analysed allowing for the possibility of fractional integration and cointegration. This permits to simultaneously maintain mean-reverting dynamics for the data, and the existence of a common long run stochastic trend. We estimate the model for the period 1963-2006, and find it compatible with this structure. The restriction that the data are I(1) and the errors are I(0) is rejected, mainly because the latter still display long memory.

CS23 Room: B217 COMPUTATIONAL STATISTICS Chair: Cristian Gatu

#135: **A genetic algorithm for estimation of simultaneous equation models**

Presenter: Domingo Gimenez@University of Murcia, Spain
Co-authors: Jose-Juan Lopez-Espin

The problem of how to obtain a Simultaneous Equation Model (SEM) from a set of variables is studied. The idea is to develop an algorithm which, given the endogenous and exogenous variables, approaches the best SEM possible according to certain criteria for model comparison. The space of the possible solutions is very large since the number of equations of the best model is between one and the total number of endogenous variables. Because of that exhaustive search methods are not very suitable and metaheuristic techniques are applied instead. This work analyses the solution of the problem via genetic algorithms. The solution is not necessarily the best, but the cost of finding it is much lower than the cost of finding the best one when using exhaustive search methods. A basic version of a genetic algorithm is presented first. After that, a greedy method is used to improve the algorithm, so obtaining a hybrid metaheuristic. The idea is to use the greedy method in some parts of the genetic algorithm to explore the solutions space better.

#191: **On some generalization of seemingly unrelated regression equation models**

Presenter: Diana Santalova@Riga Technical University, Latvia
Co-authors: Alexander Andronov, Andrey Svirchenkov

We consider a group of G objects with numbers $i = 1,2,...,G$. The i-th object is examined n_i times, at the time moments $t_{i,1} < t_{i,2} < \cdots < t_{i,n_i}$. At the j-th time moment $t_{i,j}$ we fix a vector of independent variables $x_{i,j} = (x_{i,j}^{(1)}, x_{i,j}^{(2)}, ..., x_{i,j}^{(m_i)})$ and a value of a dependent variable $Y_{i,j}$. It is supposed that the last is formed by the linear-regression equation. Further if for two various objects i and i' the time moments $t_{i,j}$ and $t_{i',j'}$ coincide then the random variables $Y_{i,j}$ and $Y_{i',j'}$ are correlated random variables with the covariance $c_{i,i'}$ whereas for various time moments they are assumed independent. As usually it is assumed that for $i = 1,2,...,G$; $j = 1,2,...,n_i$; $x_{i,j} = (x_{i,j}^{(1)}, x_{i,j}^{(2)}, ..., x_{i,j}^{(m_i)})$ are known constant vector, $Y_{i,j}$ is the fixed value. On this base it should to estimate the unknown parameters of the regression model. Our final aim is to get a prognosis of the sum of dependent variables for future time moment t. The described model generalizes the seemingly unrelated regression equation model. We applied the presented approach for the real financial data sets and investigate its efficiency.

#202: **Index tracking by estimation-based local search**

Presenter: Giacomo Di Tollo@University of Chieti, Italy
Co-authors: Prasanna Balaprakash

In a wide range of combinatorial optimization problems, such as portfolio management, vehicle routing, resource allocation and scheduling, only a part of the information needed for assessing the cost of a solution is available. In order to solve these problems, researchers and analysts often consider a framework in which the cost of each solution is a random variable and the goal is finding a solution that minimizes some statistics of the latter. In this particular framework, for a number of practical and theoretical reasons, the optimization is performed with respect to the expectation. Two types of solution techniques have been discussed inside this framework: The most widely used solution technique consists in using a well established analytical development for computing the expectation. The second solution approach, which is the focus of our work, consists in using Monte Carlo simulation to estimate the expectation. We refer to this technique as empirical estimation. The empirical estimation approach for stochastic combinatorial optimization falls into the so-called sample average approximation: the given stochastic optimization problem is transformed into a so-called sample average optimization problem, which is obtained by considering several samples of the random variable and by approximating the cost of a solution with a sample average function. The aim of this work is to design a local search algorithm that adopts the empirical estimation approach to the index tracking problem. In this framework, the estimation approach can be used under the assumption that both index and portfolios' return can be described as a random variable and the first two moments (mean and variance) suffice to explain the behaviour of an index. Provided this, the index tracking objective will be given by a metric of the difference between samples of portfolio and index returns. Our conjecture is that this approach will lead to robust out-of-sample results. Furthermore, it is a sound way of combining principles from the two most used portfolio selection models (Mean-Variance and Index Tracking) in an unique framework.

#72: **Some asymptotics for elemental regression estimators**

Presenter: Keith Knight@University of Toronto, Canada

Elemental regression estimators are defined to be estimators based on exactly p cases where p is the dimension of the predictors. Some estimators (for example, regression quantile estimators) are exactly elemental estimators while in other cases, estimators can be well-approximated by elemental estimators. However, evaluating best elemental estimators is highly computationally intensive. In this paper, we will consider the asymptotic distribution for the approximation error for a certain class of estimators as well as the asymptotic distribution of the predictors in the best elemental set. These latter results can be used, for example, to derive computational algorithms to search more efficiently for the best elemental estimator. Some other applications will also be discussed.

#245: **Random number generation and computer experiment**

Presenter: Dennis Lin@Penn State University, USA

This talk attempts to address the fundamental question of *what is computer simulation?* Pseudo-Random Number Generator is perhaps the first issue to be discussed. It has been used in a variety of fields. The quality of random number and recent development in this area will be presented. The second portion of the talk will focus on computer experiments. Computer models can describe complicated physical phenomena. However, to use these models for scientific investigation, their generally running times and mostly deterministic nature require a special designed experiments. Recent advances on Latin Hypercube and Uniform Design will be discussed.

CS27 Room: E003 FINANCIAL TIME SERIES Chair: Hwai-Chung Ho

#90: **On testing some non-nested time series models with equal low-order unconditional moments**

Presenter: Wai Sum Chan@Chinese University of Hong Kong, Hong Kong
Co-authors: King Chi Hung, Koon Shing Kwong

The class of Markov regime-switching models has been widely employed in the literature to explain various empirical phenomena

in observed economic and financial time series. On the other hand, linear time series processes (particularly, the class of ARMA models) have been reasonably successful as a practical tool for time series analysis and forecasting. Interestingly, it is found that a simple non-linear Markov switching model and a linear ARMA(1,1) model could have the same unconditional mean, variance and autocorrelation structure. They also produce very similar short-term and long-term forecasts. In this paper, we compare the power of some specification tests for differentiating these two classes of non-nested models. Real financial time series data are used as examples.

#173: **A corrected Value-at-Risk predictor**

Presenter: . . . . . Carl Lonnbark@Umea University, Sweden

Value-at-Risk (VaR) has become a standard measure of market risk and is widely used by financial institutions and their regulators. In fact, the Basel Committee on Banking Supervision imposes on financial institutions such as banks and investment firms to meet capital requirements based on VaR. Accurate VaR estimates are therefore crucially important and VaR has already received much attention in the literature. Although the literature dealing with different modelling issues is large, surprisingly little is written about the uncertainty of VaR predictors. Predictors of VaR are open to two main sources of errors: The true data generating process is not known, which gives rise to model risk, and the parameters of the hypothesized model must be estimated, which gives rise to estimation risk. The question a practitioner naturally poses is how uncertainty in the VaR affects risk management, i.e. does it in some way change what value to report. The focus of this paper is the question of how to incorporate the estimation error in the VaR predictor. In particular, we take a time series model and argue that the implied conventional VaR predictor underestimates the portfolio risk. We emphasize that this is due to the fact that the VaR predictor is random and it is not due to conventional bias, i.e. that the expected value of the VaR predictor is different from the true value. It is relatively straightforward to correct the predictor to give the correct risk measure interpretation and a simple correction is proposed. The importance of the correction is studied for FTSE 100, Nikkei 225 and S&P 100. We find that it is economically relevant.

#92: **A generalization of weighted Chinese restaurant type processes for a class of mixture time series models**

Presenter: . . . . . Mike So@The Hong Kong University of Science and Technology, Hong Kong
Co-authors: . . . . . John Lau

This article generalizes a Gibbs sampling method, namely Gibbs weighted Chinese restaurant (gWCR) process algorithm, for a class of Dirichlet process kernel mixture of time series models. This class of models is an extension of Lo's (1984) kernel mixture model for independent observations. The kernel we consider allows us to have time dependent latent variables or functions of time dependent latent variables. The present time series observations are dependent not only on past observed time series but also on past and present latent variables. The latent variables have a random discrete (almost surely) distribution based on a Dirichlet process. The class of the kernel mixture of time series models includes infinite mixture of autoregressive processes and infinite mixture of generalized autoregressive conditional heteroskedasticity (GARCH) processes. As in Dirichlet process mixture models, partitions sampling aims to evaluate the posterior expectation. Unfortunately, the Gibbs weighted Chinese restaurant (gWCR) process algorithm is no longer useful because of the dependency among the latent variables. We contribute to generalize the Gibbs weighted Chinese restaurant (gWCR) process algorithm that reseats items sequentially from partitions. In the case of Lo's (1984) models, our generalization is reduced to be the original Gibbs weighted Chinese restaurant (gWCR) process algorithm. An alternative Gibbs algorithm is also considered to alleviate the computational burden from high dimensional integration. Methodology is illustrated through the volatility estimation of 10 financial indices fitted to the infinite mixture of GARCH models. An extension is also considered to more general random probability measures, two parameter Poisson-Dirichlet processes and normalized generalized Gamma processes.

#79: **Sample quantile analysis for long-memory stochastic volatility models**

Presenter: . . . . . Hwai-Chung Ho@Academia Sinica, Taiwan

The long-memory stochastic volatility (LMSV) model has been proposed for modeling many financial returns, and proves to capture the correlation structure of return's volatility. In the literature most studies on the LMSV model have been focused on the estimation of the memory parameter or the decay rate of volatility correlations. Issues about estimating distributional parameters of the underlying returns has not been paid adequate attention. The present paper aims to discuss the asymptotical properties of sample quantiles of returns which follows the LMSV model. The quantile estimator we choose is the one based on the absolute deviation loss. We establish that the quantile estimates are asymptotically normal but with the convergence rate slower than root-n due to the strong dependence carried in the model's latent volatility component. In order to construct confidence intervals, instead of estimating both the convergence rate and the limiting variance, a resampling device is used to estimate the normalization constants. We show that this resampling procedure is consistent. A simulation study is conducted and the results are in consistency with the theory we have obtained. It is also demonstrated in the simulation that the resampling procedure of constructing confidence intervals outperforms the method of estimating the convergence rate and the limiting variance separately. We apply our theory to the VaR estimates of S&P 500 daily returns and indicate the consequent estimation biases caused by not taking into account of the long-memory property exhibited by the return's volatility.

CS37 Room: B103 ROBUST INFERENCE Chair: Michele La Rocca

#37: **Second-order accurate and robust indirect inference**

Presenter: Veronika Czellar@HEC Paris, France
Co-authors: Elvezio Ronchetti

Indirect inference is a simulation-based estimation method dealing with econometric models whose likelihood function is intractable. Typical examples are diffusion models described by stochastic differential equations. An additional problem that arises when estimating a diffusion model is the possible model misspecification which can lead to biased estimators and misleading test results. A robust indirect inference to correct the errors due to model misspecification has previously been proposed. The standard asymptotic approximation to the finite sample distribution of the robust indirect estimator, however, can be very poor and can lead to highly misleading inference. To improve the finite sample accuracy, we propose in this paper robust saddlepoint tests based on asymptotically equivalent M-estimators of the robust indirect estimators. We apply the robust saddlepoint tests to various contaminated diffusion models.

#130: **Robust optimisation of the equity price momentum strategy**

Presenter: Arco Van Oord@Erasmus University Rotterdam, Netherlands
Co-authors: Martin Martens, Herman K. Van Dijk

Markowitz' portfolio theory implies that investors should choose stock portfolio weights to optimally balance their return and risk. Key problem in optimizing these portfolio weights are estimation errors in especially expected returns that move away the computed portfolio weights from the optimal weights. This problem can be reduced by either robust estimation of expected returns or by taking into account uncertainties in these expected returns in the optimization process. For expected returns often long-term historical averages are used in the literature, which have little explanatory power for future returns. Hence any solution that shrinks these poor expected return estimates almost always looks good. Utilizing raw momentum signals, i.e. past 6-month returns, we address the issue of portfolio optimisation under uncertainty in case of informative input for expected returns. The momentum strategy, ranking stocks on past six months returns and subsequently buy the top decile and short-sell the bottom decile, has yielded an average annual return of 6.5% for US stocks. We use both Bayesian shrinkage estimates of expected returns, and robust optimisation. Doing both constitutes a new feature of this study. This is done for real-world US stock data rather than in a controlled simulation environment.

#75: **Infinitesimal robustness for diffussions**

Presenter: Davide La Vecchia@Univeristy of Lugano, Switzerland
Co-authors: Fabio Trojani

We develop infinitesimally robust statistical procedures for general diffusion processes. We first prove existence and uniqueness of the times series influence function of conditionally unbiased M–estimators for ergodic and stationary diffusions, under weak conditions on the (martingale) estimating function used. We then characterize the robustness of M–estimators for diffusions and derive a class of conditionally unbiased optimal robust estimators. To compute these estimators, we propose a general algorithm, which exploits approximation methods for diffusions in the computation of the robust estimating function. Monte Carlo simulation shows a good performance of our robust estimators and an application to the robust estimation of the exchange rate dynamics within a target zone illustrates the methodology in a real–data application.

#248: **Inference for style analysis coefficients: a robust approach**

Presenter: Domenico Vistocco@University of Cassino, Italy
Co-authors: Michele La Rocca

Style analysis, as originally proposed by Sharpe, is an asset class factor model aiming at obtaining information on the internal allocation of a financial portfolio and at comparing portfolios with similar investment strategies. Essentially, as widely described by Horst et al., style analysis is used: (i) to estimate the relevant factor exposure of a financial portfolio, (ii) in performance measurement as the style portfolio can be used as a benchmark in evaluating the portfolio performance, (iii) in order to predict future portfolio returns, as, from empirical results, factor exposures seem to be more relevant than actual portfolio holdings. The aim of the paper is to investigate the use of quantile regression to draw inferences on style coefficients. In this paper we compare the approximation proposed by Lobosco and Di Bartolomeo with robust estimators based on constrained median regression. The inference process exploits a rolling window procedure based on the subsambpling theory. Different sets of outliers have been simulated in order to show differences in the efficiency, in the coverage error and in the length of the resulting confidence intervals. Moreover quantile regression approach allows to gain additional efficiency through the use of L-estimators based on linear combinations of conditional quantile estimates.

CS38 Room: AUM EXTREME VALUE AND ELECTRICITY PRICES Chair: Carl Scarrott

#187: **Stochastic modelling of electricity prices**

Presenter: Ongorn Snguanyat@Queensland University of Technology (QUT), Australia
Co-authors: Vo Anh, Zu-Guo Yu

This paper investigates two key features of electricity prices, namely their long-range dependence (LRD) and spiky behaviour.

These two properties are modelled in the framework of fractional stochastic differential equation (SDE) driven by stable noise. The order of the fractional derivative in the SDE describes the LRD of the process, while the stable noise input models its spiky feature via the tails of its probability density. We provide a method using the empirical densities and detrended fluctuation analysis to estimate all the parameters of the model and simulate its paths. The method is then applied to analyse daily average spot prices for five states of Australia. The data are downloaded from the website www.nemmco.com.au of NEMMCO. This is the operator of the national electricity market and the national grid of Australia. We provide a detailed analysis for the price series for Victoria over the period 1 December 1998–30 March 2008. Annual cycles are removed from the data before a fractional SDE can be fitted to it. Paths from the model and their corresponding empirical densities are generated to evaluate the method.

#217: **De-clustering of extreme events: application of a time-varying threshold**

Presenter: . . . . . Dietmar Maringer@University of Essex, UK
Co-authors: . . . . . Evdoxia Pliota

Extreme Value Theory (EVT) allows estimating the asymptotic distribution of extreme values. In the "peaks over threshold" approach, an extreme event is defined as a return that exceeds a pre–specified threshold. One of the main underlying assumptions is that the different extreme events in a time record are i.i.d. This assumption, however, rarely holds for financial data: Empirical evidence shows that extreme losses are clustered and exhibit high autocorrelation, and this contradicts the very basis of EVT analysis. This study suggests approaches that can deal with this problem by replacing the fixed with a time–varying threshold. Based on the stylized fact that the distributions of returns can change over time, models for time–varying conditional variance, skewness and kurtosis are considered. Two models for the time–varying threshold are suggested where the first is based on a GARCH model. The second builds on a generalized t distribution with time varying conditional variance, skewness and kurtosis. Since this model cannot be estimated reliably using traditional techniques, a genetic algorithm is used as heuristic methods have been found useful for demanding econometric estimation problems in the literature. The time–varying threshold is then being estimated utilizing the Cornish–Fisher approximation. To test the different approaches, an empirical study for 24 stocks from the DJIA is performed. The results show that under a fixed threshold, extreme events do cluster and therefore violate the underlying assumption of EVT. Accounting for conditional variance remedies some of the problems; when higher moments are included, the clustering of the extreme events vanishes in virtually all cases. The results indicate that conditional volatility, skewness and kurtosis should be considered for the estimation of the moving threshold.

#117: **Functional framework for building quantitative models using real time news event processing**

Presenter: . . . . . Philip Gagner@RavenPack International, USA

A computation environment that operates in real time, where a remote network user receives news events from a server, is studied. The events are functions to be evaluated in a local environment maintained for the user. The evaluation of the function causes information to flow from the server to the user's environment. The effect of this is to permit news distribution where meaning of a news story is determined by the context of the user. Other existing systems attach tags to stories to indicate meaning or aboutness, leading to thousands or even tens of thousands of such tags. This alternative approach is built on the framework provided by RavenPack International's RavenPack News Analytics, and implementations in R, S+, MATLAB, Scheme, Lisp, and Prolog are discussed, with examples of actual use in constructing financial models that are automatically updated by news. Examples provided are: VIX (Volatility Model) technical emulator derived entirely from news sentiment; Effect of Corporate Press Release on Subsequent Option Price Behavior; Effect of News Dry-up on Option Prices; Fed Interest Rates & Fed News.

#181: **Quantile estimation using extreme value mixture models**

Presenter: . . . . . Carl Scarrott@University of Canterbury, New Zealand
Co-authors: . . . . . Anna Macdonald

Extreme value models are typically used for estimating quantities like value at risk. The traditional asymptotically motivated extreme value model for distribution tails (exceedances over high thresholds) is the Generalised Pareto distribution. Substantial uncertainty can be introduced due to the selection of the threshold. In general, somewhat subjective threshold choices are made using graphical tools. Recently, various mixture type models have been proposed for the entire distribution function, simultaneously capturing the bulk of the distribution with the flexibility of the Generalised Pareto for the upper/lower tails. These mixture models either explicitly include the threshold as a parameter to be estimated, or somewhat bypass this choice by the use of smooth transition functions between bulk and tail models. A possible drawback to the smooth transition function models in traditional extreme value applications is the potential influence of data from the entire sample range on tail estimation. We examine the influence of data over the entire sample range on tail estimation. We discuss a simulation study which examines the performance of the proposed model.

Saturday 21.06.2008 11:20-13:20 Parallel Session J

ES03 Room: B103 ROBUST REGRESSION Chair: Roland Fried

#23: **Robust variable selection**

Presenter: ..... Charlotte Guddat@TU Dortmund, Germany

In multiple regression it is a well known problem that often only a small subset of all given candidate predictors actually effects the response, while the rest might inhibit the analysis. In practice, data is often contaminated by outliers whose identification is a challenging task when the predictor space is high dimensional. Such outliers have to be taken into account as they might lead to the deselection of true predictors or the selection of noise variables, respectively. We study the performance of two methods for variable selection - EARTH and SIS - recently proposed w.r.t. their robustness against such contaminations and propose robust modifications where necessary.

#27: **Online time series analysis by robust regression filters**

Presenter: ..... Karen Schettlinger@TU Dortmund, Germany
Co-authors: ..... Matthias Borowski, Ursula Gather

Current alarm systems in intensive care monitoring are clinically unsatisfactory: for the detection of critical situations, variables such as heart rate or pulse are recorded at high frequency and compared to thresholds set by the medical staff. These alarm systems produce many false alarms due to measurement artefacts or transient fluctuations around the chosen alarm limit. The monitored time series exhibit trends, abrupt level or trend changes, but there are also relatively stable periods. The measurements are overlaid with noise and outliers, and there may be a strong dynamic dependence between certain variables. Alarm rules based on the noise-free and artefact-free underlying signal of such time series can considerably reduce the number of false alarms. We present univariate and multivariate filtering procedures for robust online signal extraction which are able to preserve clinically relevant patterns such as trends or abrupt shifts and remove irrelevant outliers. Our approach uses high-breakdown linear regression in moving time windows with a data-driven choice of the window width. The proposed methods are fast, efficient and robust, and can be applied to time series with low variability as well as to noisy or contaminated data with missing values.

#33: **Dimension reduction for high dimensional regression problems based on local principal curves**

Presenter: ..... Jochen Einbeck@Durham University, UK
Co-authors: ..... Ludger Evers

Frequently the intrinsic dimensionality of the predictor space of a p-variate regression problem is in fact much smaller than p, often even only one-dimensional. Usual modeling attempts such as the additive model, which try to reduce the complexity of the regression problem by making additional structural assumptions, are then inefficient as they ignore the inherent structure of the predictor space and involve complicated model and variable selection stages. In a fundamentally different approach, one may consider first approximating the predictor space by a (usually nonlinear) curve passing through it, and then regressing the response only against the one-dimensional projections onto this curve. This entails the reduction from a p- to a one-dimensional regression problem. As a fully nonparametric tool for the compression of the predictor space we apply local principal curves, which form a more flexible alternative to earlier proposed principal curve algorithms as they also allow for branched or disconnected curves. If a local principal curve is to be used as a predictor in a regression problem, then it has to be parametrised retrospectively, which is non-trivial. Once this is achieved, the projections of the initial data onto the curve are computed, and the regression step can then be carried out using any nonparametric smoother. We illustrate these techniques using 16- and higher dimensional data from astrophysical applications. Possible extensions to more than one-dimensional nonparametric summaries of the predictor space are discussed. The robustness of the method to variation of bandwidth and starting points, as well as to outlying data patterns, is investigated.

#37: **Evolutionary algorithms for robust methods**

Presenter: ..... Robin Nunkesser@TU Dortmund, Germany

A drawback of robust statistics is the increased computational effort often needed compared to non robust methods. Robust estimators possessing the exact fit property, for example, are np-hard to compute. This means that - under the widely believed assumption that the computational complexity classes np and p are not equal - there is no hope to compute exact solutions for large high dimensional data sets. To tackle this problem, search heuristics are used to compute np-hard estimators in high dimensions. Here, a basic evolutionary algorithm that is applicable to numerous robust estimators is presented. Further, variants of this evolutionary algorithm for selected estimators - most prominently least trimmed squares and least median of squares - are introduced and shown to outperform existing popular search heuristics in difficult data situations. The results increase the applicability of robust methods and underline the usefulness of evolutionary computation for computational statistics.

ES07 Room: B013 PENALIZATION APPROACHES: ALGORITHMS, SOFTWARE AND APPLICATIONS Chair: Marta Avalos

#17: **On the distribution of the adaptive Lasso estimator**

Presenter: Ulrike Schneider@University of Vienna, Austria
Co-authors: Benedikt Poetscher

The adaptive Lasso, a variant of the Lasso, is a penalized least-squares (LS) estimator which acts simultaneously as variable selection and coefficient estimation method. The estimator possesses an 'oracle'-property (for certain choices of tuning parameters), i.e. its asymptotic distribution under fixed parameters coincides with the one of the OLS-estimator of the smallest correct model and is, in particular, normal. We study the distribution of the adaptive Lasso estimator for a linear regression model with orthogonal regressors and Gaussian errors 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 and mention similar previous results for other well-known penalized LS-estimators. Moreover, the uniform convergence rate is obtained and shown to be slower than root-n in case the estimator is tuned to perform consistent model selection. In this context, we also discuss the questionable statistical relevance of the 'oracle'-property of the estimator. We present simulation results for the case of non-orthogonal regressors to 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 estimator.

#35: **Efficient implementation and experimentation with the LARS-lasso algorithm**

Presenter: Frank Vanden Berghen@Business-Insight, Belgium

We present some experiments where we used the LARS-lasso algorithm to construct very stable and efficient predictive models. The investigation covers datasets originating from many fields: Biological network inference, Business-Intelligence (churn prediction, propensity models), computational genomic applications (cancer prevention), automatic document classification (text mining). The LARS algorithm has been used to solve the PAKDD 2007 Data Mining competition (cross-selling problem). A straight forward model built in one afternoon ranked 6th at the competition. Most of the results presented are computed using a new automated data mining software named *The Datamining Machine (TIM)*. We will try to explain, based on the theoretical properties of the LARS algorithm, why it is so efficient for variable selection. The LARS algorithm is the heart of the variable-selection-procedure implemented inside TIM. This implementation is using tailor-made, linear algebra routines that divide the computation time roughly by 10,000 compared to a classical implementation (such as in SAS or R). This implementation can also handle datasets with 200.000 variables and 18.000.000 rows. The special algorithms used inside this faster version of the algorithm are briefly described. We also illustrate, using numerical results, that BAGGING techniques are combining very efficiently with the LARS algorithm.

#47: **Simple and interpretable discrimination**

Presenter: Nickolay Trendafilov@Open University, UK
Co-authors: Karen Vines

A number of authors have proposed approaches for constructing alternatives to principal components that are more easily interpretable while still preserving the nice features of the principal components. This work employs one such approach to produce interpretable canonical variates and explores their discrimination and classification behavior.

#60: **Testing for the generalized normal-Laplace distribution with applications**

Presenter: Simos Meintanis@University of Athens, Greece
Co-authors: Efthimios Tsionas

The generalized normal-Laplace distribution is a useful law for modelling asymmetric data exhibiting excess kurtosis. In this paper goodness-of-fit tests for this distribution are constructed which incorporate maximum simulated likelihood estimation of the parameters and utilize the corresponding moment generating function. Applications of the tests with real data sets are included.

#45: **Parsimonious additive logistic models**

Presenter: Marta Avalos@University of Bordeaux 2, France

Logistic regression is a standard tool in statistics for binary classification. The logistic model relates the logarithm of the odds-ratio to the predictors via a linear regression model. A generalization is the additive logistic model, which replaces each linear term by an unspecified smooth function, allowing for more flexibility while preserving interpretability. Another variant is penalized logistic regression, which shrinks coefficients to improve the accuracy of prediction. Ridge regression (L2-penalization) and lasso (L1-penalization) are the main penalization procedures. An attractive property of the later is that it performs parameter estimation and variable selection simultaneously. New theoretical results, efficient algorithms, and available software play a major role in the recent popularization of lasso. In this study, L1-penalization is adapted to additive logistic regression fitted by smoothing splines. Coefficients associated to predictors with little effect on the response may be shrunk (some of them to zero). This approach gives parsimonious models, removes irrelevant variables, and identifies non linear trends. The estimates are computed via the usual Newton-Raphson update, combined with the lars-lasso algorithm, to resolve the penalization problem, and the backfitting algorithm to fit additive models. Different criteria based on the effective degrees of freedom are proposed to choose the penalization parameters. Performance is illustrated with some examples.

ES19 Room: B104 TIME SERIES AND DESIGN SPECIFICATION Chair: Janet Godolphin

#68: **Outlier evaluation for the bilinear time series model**

Presenter: Ibrahim Mohamed@University of Malaya, Malaysia

The problem of detecting an outlier and then identifying its type for bilinear time series data is studied. The effects of additive and innovational outliers on the observations and residuals for general bilinear processes are considered and corresponding least-squares measures of the decision thresholds are proposed. Due to the complexity of the statistics, we suggest to use a bootstrapping method to estimate the mean and standard deviation of the threshold statistics. The performances of three bootstrap-based procedures are compared favourably with the model-based procedure through simulation studies. For illustration, the procedures are applied for detecting outliers in local rainfall data.

#71: **Smooth polynomial interpolators**

Presenter: Hugo Maruri Aguilar@London School of Economics, UK
Co-authors: Henry Wynn

Splines are piecewise polynomial functions, known to minimise smoothness properties in one and higher dimensions. However, splines are not always continuously differentiable and sometimes it might be difficult to construct splines over irregular design regions. Smooth saturated interpolators can be constructed by first extending the monomial basis and then minimising over a given region a measure of smoothness with respect to the free parameters in the extended basis. This method allows a polynomial approximation to splines and allows for a flexible smoothing region. The resulting model shares all the advantages of polynomial models (linearity in parameters and in observations), while at the same time is smooth and thus close to a spline model. As an example, this technique is applied to sensitivity analysis of computer simulations.

#110: **Specification, identification and prediction of components of time series models in state space form**

Presenter: Edward Godolphin@Royal Holloway, University of London, UK

The decomposition of a discrete time series y_t into scalar but unobserved and independent component processes is a long-standing time series objective. The underlying feature with this objective is a signal process component which is decomposed into independent but unobserved trend and/or cyclical components and, in most cases, this decomposition link is typically contaminated by irregular noise. Often one or more of the separate components are of greater interest to the practitioner than the process y_t itself, taken as a whole, but the three inferential elements of specification, identification and forecasting of these components is not always straightforward. In this presentation it is shown that the state-space representation for y_t lends itself naturally to these three elements. A number of general results are derived and some examples are given to illustrate the general principles involved.

#54: **Non-asymptotical minimax estimation of parametric families of functionals in noise**

Presenter: Boris Darkhovskiy@Institute for Systems Analysis RAS, Russia

The problem of minimax estimation of a parametric family of functionals defined on some subset W in the linear normed space under a finite number of noisy observations is considered. The observations have the form $z = F(x) + \xi, x \in W$, ξ is a random vector. One of the main applications is a minimax estimation of a function from a given class defined on some segment under noisy observations of its values at finite numbers of points. A new formalization of this problem is proposed. The main idea is as follows. We equip the finite-dimensional image $F(W)$ with the natural probabilistic measure generated by the density function of the noise and consider the estimation procedure as a game with the "nature" which choose a vector $F(x)$ from $F(W)$ according to this measure. The best estimate is now the optimal solution of this game. On this way we can get the non-asymptotical minimax estimate under week asumptions on the noise density function. In case the observations have the form $z_i = F(x) + \xi_i, i = 1, \ldots, n$ with i.i.d. random variables ξ_i we can prove that the optimal solutions tend a.s. (for every value of the parameter of the functionals' family) to the optimal solutions of the corresponding deterministic problems with the rate $O(\sqrt{n^{-1} \ln n})$. In the most interesting cases the optimal solutions can be easily calculated by computer. Some examples are considered.

#111: **Missing values in experimental design**

Presenter: Janet Godolphin@University of Surrey, UK

One of the problems associated with planned experiments is the possibility that some observations may be lost during the experimental process in which case the eventual design will be different to the original planned design. If the lost observations comprise a rank reducing observation set (RROS) then the eventual design is disconnected and the planned experiment is likely to be severely damaged. This talk will discuss methods for measuring and recognising RROSs and it will be shown that some very efficient designs are also highly vulnerable to observation loss. Illustrations will include balanced incomplete block designs, cross-over designs and factorial designs. The talk will also outline some outstanding issues on missing values in experimental design that require resolution.

ES21 Room: GB1 DISCRIMINANT PROBLEMS AND SAMPLE COORDINATION Chair: Alina Matei

#107: **Updating a discriminant rule**

Presenter: Farid Beninel@CREST-ENSAI & LMA UMR-CNRS 6086, France
Co-authors: Christophe Biernacki

Often a discriminant rule to predict individuals from a certain subpopulation is given, but the individuals to predict belong to another subpopulation. Two distinct approaches are usually implemented. The first approach is to apply the same discriminant rule for the two sub-populations. The second approach is to estimate a new rule for the second subpopulation. The first approach does not take into account differences between sub-populations. The second is not reliable in cases of few available individuals from this second subpopulation. Our approach to get a rule for the second sub-population consists of different models of disturbance of the original rule (e.g. a linear function corresponding to the Anderson scoring). The parameters of these models are estimated on the basis of individuals from the second subpopulation. Using some real data we realize some simulations to compare six models of disturbance.

#82: **Estimating the logistic auto-logistic model with missing data: some simulation results**

Presenter: Giuseppe Arbia@University of Trento, Italy
Co-authors: Marco Bee, Giuseppe Espa

Most techniques for missing-data have to be modified to take care of the features of spatially dependent data. Several tools have been developed, according to the estimation methodology, the nature of missing data and the goals of the analysis. Recently a new algorithm for the estimation of the parameters of a Logistic Auto-logistic Model has been proposed when some values of the target variable are missing but the auxiliary information is known for the same areas. This is a Monte Carlo EM algorithm in the setup of Maximum Pseudo-Likelihood Estimation (MPLE). Within this framework, we perform a simulation study of the properties of the MPL estimators. Although the asymptotic distribution is known to be normal the explicit formulae for the covariance matrix are complicated and therefore Monte Carlo techniques are employed. Moreover, the information-based approximation of standard errors depends on both the number of areas and the percentage of missing data. The behavior of the estimators as the percentage of missing data increases is considered. The conditions under which the algorithm breaks down are investigated.

#59: **Optimal sample co-ordination**

Presenter: Alina Matei@University of Neuchatel, Switzerland

Sample co-ordination regards maximization or minimization of the overlap of two or more samples selected from overlapping populations. It can be done for designs with simultaneous or sequential drawings of samples. We describe a method to make sample co-ordination in the former case. Let us consider the case where units are to be selected with maximum overlap using two designs with given unit inclusion probabilities. The quality of the co-ordination is measured through the sample overlap which is usually random. The expected overlap is bounded by theoretical bounds, which depend on the unit inclusion probabilities. We are interested in the theoretical upper bound called the absolute upper bound. If the expected overlap equals the absolute upper bound, the sample co-ordination is maximal. Most of the methods given in the literature consider fixed probability designs. Yet, the absolute upper bound is not always achieved. We propose to construct optimal probability designs for given unit inclusion probabilities in order to realize the maximal co-ordination. Our method is based on some theoretical conditions on joint probability of two samples and on the controlled selection method with linear programming implementation.

#80: **General framework for the rotation of units in repeated survey sampling**

Presenter: Desislava Nedyalkova@Universite de Neuchatel, Switzerland
Co-authors: Lionel Qualite, Yves Tille

The negative coordination of samples is one of the most challenging theoretical problems faced by statistical institutes. There is a number of existing solutions that try to resolve it. Our aim is to provide the core of a general theory that integrates the main existing solutions. First, we review the classical sampling designs and give a sequential algorithm for each of them. Next, we present the most commonly used methods for negative coordination: the Brewer method, the method of permutation of random numbers, and the burden method. For each method, we compute the longitudinal sampling design and give its properties. We also show that it is possible to compute the cross-sectional sampling designs and in some cases even the joint sampling design. Finally, we present a general method that allows us to apply almost any cross-sectional design with a given longitudinal systematic design. However, the cross-sectional design should be applied, at each step, on the conditional selection probabilities, which will result in a progressive loss of control over the cross-sectional designs. This difficulty sheds light on the antagonism between the requirements for the cross-sectional design and those for the longitudinal design.

CS08 Room: B217 TERM STRUCTURE, RISK, AND MONETARY POLICY Chair: Mario Padula

#194: **Real time estimation of potential output and output gap for the euro area**

Presenter: Gian Luigi Mazzi@European Commission, Luxembourg
Co-authors: Matthieu Lemoine, Paola Monperrus-Veroni, Frederic Reynes, Xavier Timbeau

In economic theory, fluctuations can be viewed as deviation from either the trend or from the potential output. Although both views seem to be quite similar, their policy implications are very different, especially concerning the role and the scope of stabilisation

policies. Empirically the distinction between the two views becomes more complex. Purely production function based approaches correspond to the second view of cyclical fluctuations. Purely univariate filtering techniques are in line with the first one. When considering multivariate models, such as unobserved component ones or structural/non-structural VARs, the interpretation of estimated cycles as output gap or trend deviation, depends on the possibility of imposing restrictions and on their economic soundness and interpretability. In this paper we present a comparison of alternative multivariate estimations of potential output and output gap based on euro area data. Particular attention is paid to the issue of data availability and to computational aspects. Both theoretical and empirical characteristics of estimated potential output and output gap are analysed. Moreover, we conduct a real time simulation to assess and compare the stability of alternative models. Finally, we suggest the most appropriate models in relation to the specific goals of business cycle analysis, policy making and forecasting.

#170: **Weighted expected shortall estimators**

Presenter: Franco Peracchi@Tor Vergata University, Italy
Co-authors: Samantha Leorato, Andrei Tanase

Given a financial asset, the Expected Shortfall (ES) is the average loss that one can suffer, conditional on the loss exceeding the Value at Risk (VaR). Unlike the VaR, the ES is a coherent measure of risk. In this paper, we extend the concept of ES to allow for observed covariates and to incorporate subjective attitudes toward extreme negative events. The key idea is to average losses by replacing the original distribution function of asset returns with a new one that subjectively reweighs extreme losses. When the weighing is uniform and the distribution of asset returns is conditional on observed covariates, we obtain the ordinary conditional ES discussed by Peracchi and Tanase (forthcoming). We present various estimators of the weighted conditional ES and study their asymptotic properties. We also present an empirical application that compares the risk associated with national stock indexes in European countries to the risk associated with EuroStoxx index, seen as benchmark.

#103: **Monetary policy and exchange rate interactions. New empirical evidence**

Presenter: Hilde Bjornland@Norwegian School of Management, Norway
Co-authors: Jorn Inge Halvorsen

This paper analyses how monetary policy responds to exchange rate movements in six small open economies; Australia, Canada, New Zealand, Norway, Sweden and the UK. We address this issue using a structural vector autoregressive (VAR) model, that is identified using a combination of zero and sign restrictions. Our suggested identification allows for a simultaneous reaction between the variables that are observed to respond intra daily to news (the interest rate and the exchange rate), but maintain the Cholesky recursive order for the traditional macroeconomic variables that are observed to respond with delay (output, inflation etc.) to economic shocks. Doing so, we find there to be great interaction between monetary policy and exchange rate movements. In particular, an exchange rate shock that depreciates the exchange rate with one percent increases the interest rate on impact (within a quarter) with 20-40 basis points. Turning to monetary policy, we find the impact on the exchange rates to be non-trivial and consistent with Dornbusch overshooting. In particular, a contractionary monetary policy shock that increases the interest rate with 100 basis point, appreciates the exchange rate by 2.5-4 percentages. Following the initial effect, the exchange rate thereafter gradually depreciates back to baseline consistent with UIP.

CS11 Room: E003 OPTION PRICING Chair: Zdenek Hlavka

#51: **On extracting information implied in options**

Presenter: Milos Kopa@Charles University in Prague, Czech Republic
Co-authors: Michal Benko, Matthias Fengler, Wolfgang Hardle

Options are financial instruments with a payoff depending on future states of the underlying asset. Therefore option markets contain information about expectations of the market participants about market conditions, e.g. current uncertainty on the market and corresponding risk. A standard measure of risk calculated from plain vanilla options is the implied volatility (IV). The IV can be understood as an estimate of the volatility of returns in future period. Another concept based on the option markets is the state–price density (SPD) that is a density of the future states of the underlying asset. From raw data we can recover the IV function by nonparametric smoothing methods. Smoothed IV estimated by standard techniques may lead to a non–positive SPD which violates no arbitrage criteria. In this paper, we combine the IV smoothing with SPD estimation in order to correct these problems. We propose to use the local polynomial smoothing technique. The elegance of this approach is that it yields all quantities needed to calculate the corresponding SPD. Our approach operates only on the IVs-a major improvement comparing to the earlier multi–step approaches moving through the Black–Scholes formula from the prices to IVs and vice–versa.

#25: **Monotonicity of pricing kernels**

Presenter: Roman Timofeev@Humboldt Universitat zu Berlin, Germany
Co-authors: Yuri Golubev, Wolfgang Hardle

The behaviour of market agents has been extensively studied. Risk averse behaviour which has been described via a concave utility function, is considered to be a cornerstone of classical economics. Agents prefer a fxed profit over an uncertain choice with the same expected value. However, lately there has been a considerable discussion about the reliability of this approach. It has been shown that there is a reference point where market utility functions are convex. In this paper we have constructed a test to verify uncertainty about the concavity of agents' utility function by testing the monotonicity of empirical pricing kernels (EPKs).

A monotone decreasing EPK corresponds to a concave utility function while non-monotone decreasing EPK means non-averse pattern on one or more intervals of the utility function. We investigated the EPK for German DAX data for years 2000, 2002 and 2004 and found the evidence of non-concave utility functions: H0 hypothesis of monotone decreasing pricing kernel was rejected at 5% and 10% significance level in 2002 and at 10% significance level in 2000.

#146: **The economic value of the Fourier estimator of the integrated covariance in terms of dynamic portfolio management**

Presenter: Simona Sanfelici@University of Parma, Italy
Co-authors: Maria Elvira Mancino, Elena Rapini

The availability of large high frequency financial data sets potentially provides a rich source of information about asset price dynamics. Specifically, nonparametric variance/covariance measures constructed by summing intra-daily return data (i.e., realized variances and covariances) have the potential to provide very accurate estimates of the underlying quadratic variation and covariation. These measures, however, have been shown to be sensitive to market microstructure noise inherent in the observed asset prices. Moreover, it is well known that the non-synchronicity leads to a bias towards zero in correlations among stocks as the sampling frequency increases. Motivated by many consequences of the effect of non-synchronous trading (estimation of betas for asset pricing, index autocorrelation, lead-lag patterns) a number of alternative covariance estimators have been proposed in the literature, such as the Hayashi -Yoshida estimator (HY) and the Fourier estimator. We consider the gains offered by the Fourier estimator from the perspective of an asset-allocation decision problem. We study the forecasting power of the Fourier estimator and other alternative realized variance measures in the context of an important economic metric, namely the long-run utility of a conditional mean-variance investor rebalancing his/her portfolio each period. We show that, when suitably implemented, the Fourier estimator carefully extracts information from noisy high-frequency asset price data for the purpose of realized variance/covariance estimation and allows for non-negligible utility gains in portfolio management. We construct daily variance/covariance estimates using the Fourier and the HY methods, as well as estimates obtained by using conventional (in the existing literature) 5- and 15-minute intervals and optimally sampled continuously-compounded returns for the realized measures. From each of these series, we derive one-day-ahead forecasts of the variance/covariance matrix. A conditional mean-variance investor can use these forecasts to optimally rebalance his/her portfolio each period. We compare the investor's long-run utility for optimal portfolio weights constructed from each forecast. The analysis is conducted both through Monte Carlo simulation and through market data.

CS45 Room: AUM VALUE AT RISK AND VOLATILITY PREDICTION Chair: Marc Paolella

#219: **A skew-normal Markov-switching GARCH process with applications to financial risk assessment**

Presenter: Markus Haas@University of Munich, Germany

Markov-switching GARCH (MS-GARCH) models provide an attractive framework for modeling the distribution of asset returns. The model class can capture most of the characteristic features of asset returns, while conditional normality within the regimes is preserved. This, along with CLT arguments, is deemed an attractive property. In the framework of these models, asymmetries are usually captured by allowing for different regime-specific means, so that the overall mixture distribution features skewness. However, this introduces autocorrelation of raw returns. This may not be desirable, since (a) it becomes impossible to disentangle the asymmetries from the autocorrelation properties of returns, and (b) many return series exhibit significant skewness but no autocorrelation. In this paper, we introduce skewness into the MS-GARCH model by taking the regime densities as belonging to the class of skew-normal densities. This distribution, while sharing many of the properties of the normal, allows for skewness of a degree sufficient for most asset returns, and it can be interpreted as a perturbed Gaussian. Its appearance can also be explained by some kind of pre-asymptotic behavior in stock markets. In applications to stock index returns the model shows a consistently strong performance.

#143: **The Gaussian mixture dynamic conditional correlation model: Bayesian estimation, value at risk calculation and portfolio selection.**

Presenter: M. Concepcion Ausin@Universidad Complutense, Spain
Co-authors: Pedro Galeano

A multivariate generalized autoregressive conditional heteroscedasticity (MGARCH) model with dynamic conditional correlations where the vector of innovations is assumed to follow a mixture of two Gaussian distributions is analyzed. The Gaussian mixture distribution postulates that a large number of multivariate innovations are generated from a Gaussian distribution with a small covariance matrix, while a small number of multivariate innovations are generated from a Gaussian distribution with a large covariance matrix. It is shown that this specification jointly with a MGARCH model with time varying correlations, can capture the stylized facts usually found in multivariate returns. Inference on the model parameters and prediction of future volatilities is addressed using a Bayesian approach via a Markov Chain Monte Carlo (MCMC) method. Furthermore, the proposed methodology allows us to obtain point estimates and predictive intervals for the Value at Risk (VaR) of a given portfolio, which is strongly affected by the specification of a convenient innovation distribution. Finally, the proposed approach also provides a method for selecting portfolios with a low out-of-sample conditional variance. The good performance of the proposed methodology is illustrated via Monte Carlo experiments and the analysis of the daily closing prices of the Dow Jones and Nasdaq indices.

#118: **Forecasting realized (co)variances with block Wishart autoregressive model**

Presenter: Matteo Bonato@University of Zurich, Switzerland
Co-authors: Caporin Massimiliano, Ranaldo Angelo

The increased availability of high frequency data provides new tools for the forecast of variances and covariances between assets. However, the recent realized (co)variance models may suffer from a curse of dimensionality problem similar to that of multivariate GARCH specifications, with the need of strong parameter restrictions, or may lead to non-interpretability of model coefficients given the introduction of matrix log or exponential functions. Among the proposed models, The Wishart Autoregressive model analyzes the realized covariance matrices without any restriction on the parameters maintaining coefficients interpretability. In fact, the model under mild stationarity conditions provides positive definite forecasts for the realized covariance matrices. Within this paper we propose a restricted parameterization of the Wishart Autoregressive model which is feasible even with a large cross section of assets. In particular, we assume that the assets variance-covariances have no or limited spillovers and that their dynamic is sector-specific. We present an empirical application based on portfolio risk evaluation.

#110: **Bayesian analysis of continuous superpositions of non-Gaussian Ornstein-Uhlenbeck processes for volatility estimation**

Presenter: Jim Griffin@University of Kent, UK
Co-authors: Mark Steel

Stochastic volatility models are a popular way to model the log returns of assets. We concentrate on modelling the volatility process by a class of non-Gaussian Ornstein-Uhlenbeck processes. These processes evolve through jumps with exponential decay between jumps whose slope depends on a single parameter. Financial data is not well-fitted by a single Ornstein-Uhlenbeck (OU) process but a superposition of two OU processes has been shown to be able to capture many of the observed properties of these time series. This paper is concerned with fitting a continuous superposition of OU processes using MCMC. This process has several attractive properties above a discrete superposition for the volatility process: 1) the model can be interpreted as allowing each jump to decay at an individual rate and 2) the process can have long memory which is considered important for modelling volatility in many applications. We fit a model which allows both long and short memory with a leverage effect using Bayesian methods and consider nonparametrically estimating the mixing distribution of the continuous superposition to allow inference over a wide-range of autocorrelation functions. The methods are illustrated on the Standard and Poors 500 index.

#149: **Bayesian parsimonious estimation of factor stochastic volatility models**

Presenter: Dimitris Korobilis@University of Strathclyde, UK

In this paper I develop a complete Bayesian treatment of the linear factor stochastic volatility model with latent factors, which proves to be essential in order to preserve parsimony when the number of cross section in the data grows large. I introduce a flexible prior distribution which allows to carry out restriction search on the parameters of the factor model, and I use it as a data-based alternative to evaluate the cross sectional restrictions suggested by the APT. A mixture innovation model is also proposed which generalizes the standard stochastic volatility specification and prevents the overparameterization problem that can occur with large datasets. I show how to use the mixture innovation model to catch both gradual and abrupt changes in the stochastic evolution of the covariance matrix of financial data. This approach has the additional advantages of dating when large jumps in volatility have occurred in the data and determining whether these jumps are attributed to any of the factors or the innovation errors.

CS46 Room: ALG LEVERAGE, CREDIT MARKETS, FINANCIAL INTEGRATION Chair: Lynda Khalaf

#96: **An econometric analysis of fractional models to credit risk pricing**

Presenter: Giovanni Urga@Cass Business School, UK
Co-authors: Arturo Leccadito

In companion papers, we propose a fractional version of two well-known credit risk pricing structural models: the Merton and Black and Cox models. We assume that the value of the firm obeys a Geometric Fractional Brownian Motion. Prices for the equity, the bond and credit spreads are derived and a sensitivity analysis is performed. To provide a justification for these models, in this paper we present a comprehensive empirical analysis using recent development in long memory literature. We apply estimation and testing procedures to test for fractional integration and fractional cointegration. We employ two different datasets: Constant Maturity Yields and Moody's Long-Term for the period December 1992-November 2003 Corporate Bond Yield Averages and Lehman Brothers Eurodollar Indices covering the period June 1996-July 2006. Long memory properties of Treasury and corporate bond yields as well as credit spreads are thus investigated.

#58: **The impact of political party convergence on tests of financial integration**

Presenter: Marie-Helene Gagnon@Universite Laval, Canada
Co-authors: Marie-Claude Beaulieu, Khalaf Linda

In this paper, we study financial market integration in North America using the international Capital Asset Pricing model (ICAPM). Moreover, we study the impact of political party convergence on financial market integration. A rejection of the hypothesis of integration may be due to either a rejection of the underlying model or a rejection of the hypothesis of integration. We also address three further econometric problems associated with the ICAPM. First, the associated likelihood function is irregular leading to

imperfect maximization. Second, the model may be locally almost unidentifiable for the null hypothesis tested. Third, since many portfolios are often used in practice, dimensionality problems may often lead to serious size problems in finite sample. To solve these problems, we extend Fieller's method to the testing framework under consideration. Preliminary results show that the ICAPM is not rejected for the 1984-1993 period but is however rejected in the 1994-2003 sub-sample. The integration hypothesis is rejected for the first sub-period; the model is however rejected in the second sub-period, which reveals specification and temporal instability problems and precludes a general conclusive decision regarding financial integration. Nevertheless, we find that political party convergence does not affect the degree of financial integration.

#121: **Statistical arbitrage between CDS and CMCDS markets**

Presenter: Radu Tunaru@City University, CASS Business School, UK
Co-authors: Giovanni Urga, Arturo Leccadito

In order to hedge away credit default risk a market participant may use the more standard credit default swap contract or the alternative constant maturity credit default swap contract. The premium is a fixed spread for the former and linked to a floating spread for the latter. Since the CMCDS price is sensitive not so much to the level of credit spreads but to the shape of the credit curve one may ask whether non-arbitrage CDS market curves allow paired trades with CMCDS contracts such that default risk is eliminated but profit is generated. Hence one could only explore the idea of statistical arbitrage. This paper explores trading strategies to identify possible imbalances that might have existed in the credit markets, during the period 2001-2006, when pairing CDS and CMCDS on the same obligors. To this end, a large database of single-name CDS premia is used to produce the corresponding CMCDS prices, derived by implementing common market models. It appears that, in general, it would have been more profitable to sell CDS and to buy CMCDS, since at least 85% of the names analysed had a negative cumulative net trading profit/loss over the 5 years period considered.

#70: **Analysis of nascent firms' conditional leverage distributions**

Presenter: Marcel Voia@Carleton University, Canada
Co-authors: Kim Huynh

Using a unique administrative firm-level database of Canadian manufacturing firms, this paper analyzes the probability density and cumulative density functions of debt-to-asset ratios both over time and between cohorts. Several important issues are addressed: Firstly, we test the degree of heterogeneity for the leverage distribution and its evolution over time by estimating a mixture of pdfs. Secondly, an analysis of conditional CDFs will identify the industries that start with higher leverage ratios. We use tests for first, second, third order stochastic dominance to determine if there is significance difference between two conditional distributions. We improve the properties of these tests by allowing the null distribution to involve nuisance parameters. Using the estimated nuisance parameters obtained from the first stage of the analysis, when the mixture distributions are estimated, we determine the critical values of the tests by employing a Monte Carlo method. Thirdly, a cohort analysis is used to test the impact of different initial conditions on the distribution of leverage. The findings of this analysis are important for policy makers as credit conditions at a given time may impact the degree of heterogeneity of leverage distribution with implications to selection of firm entry in specific industries.

Saturday 21.06.2008 15:00-17:00 Parallel Session K

CS34 Room: B013 FINANCIAL MARKET ANALYSIS Chair: Alessandra Amendola

#129: **The linear replication model in the cross-section of expected stock returns: evidence from Polish stock exchange**

Presenter: Anna Czapkiewicz@AGH University of Science and Technology, Poland
Co-authors: Wojciech Maslon

In the testing of CAPM and ICAPM models the problem of errors-in-variable appears. To omit this problem some assumption about the relation between the random error variances of the model from which we estimate market beta and of the model from which we estimate risk premium was done. In this paper, we present another approach to testing of ICAPM parameter signification without additional information. We consider the model where the replications dependent and independent variables allow us to calculate consistent estimators. The ultrastructural errors-in-variable model where all the random error variances are unknown is discussed. We accept the assumption of variances of errors of the cross sectional model dependent on portfolio index, but we introduce homoscedastic errors indexed by time. In this linear functional relationship using the maximum likelihood method we calculated the time-consistent estimators of unknown parameters and significance tests. The empirical studies cover two stages: the first one checks the influence of beta and fundamental variables on portfolio returns separately and the other - simultaneously. This approach was compared with other approaches. Numerical data from Warsaw Exchange Stock were used for simulation studies with portfolio defined either by WIG Index and Fischer Index.

#82: **Modelling stock market correlations between new EU member states and the Eurozone**

Presenter: Nektarios Aslanidis@University Rovira Virgili, Spain
Co-authors: Christos Savva

This paper aims to assess the degree of stock market integration between the three largest new EU members (Hungary, the Czech Republic and Poland) and the Euro-zone. We estimate time-varying correlations in the stock markets using the recently developed smooth transition conditional correlation (STCC) and double STCC models (Silvennoinen and Terasvirta, 2005, 2007 and Berben and Jansen, 2005). This framework allows the conditional correlations to change smoothly over time, and therefore, proves useful in capturing the effects of increasing integration of stock markets. For each country we consider market level as well as the sectoral level data during January 1999 - November 2007. The results show that at an aggregate level, for all three Eastern European markets the estimates point to a considerable increase in correlations towards the end of the sample. The increase in equity market integration is also supported to a large extent by the analysis at the sectoral level. Despite the increase in correlations, in the majority of cases sectoral correlations are still lower than those at the aggregate level. The implication of this result for portfolio diversification is that sectors in Eastern European markets may provide larger diversification opportunities than the aggregate market.

#98: **Empirical evidence from the Greek stock market on the Fama-French three factor model**

Presenter: Panayiotis Artikis@University of Piraeus, Greece

In the past years, in the finance literature internationally, there has been an increased attention to the Fama & French three-factor asset-pricing model (3FM). The vast majority of this empirical research has been conducted using data mainly from the US. The objective of the present research is to examine empirically the Fama & French three factor asset pricing model using data from the Athens Stock Exchange over a time period from 1995 to 2006. Specifically, the study examines whether the behavior of stock prices of Greek listed firms can be explained by a size factor, as described by the market value of equity, and a value factor, as described by the ratio of book to market value. The significance of the present study is that it adds to the sparse literature of the ability of the 3FM to explain stock returns of Greek firms. The sample consisted of all listed companies in the Athens Stock Exchange and it included a total of 2,621 companies for the ten-year period with the smallest contribution from 1996 with 187 companies and the largest from 2003 with 306. The results of the study showed that the average return of high book to market portfolios is greater that that of low book to market portfolios. Furthermore, the average return of the small market value portfolios is greater that that of the high market value portfolios for all three book to market portfolios. Overall the results of the present study showed the superiority of the 3FM over the CAPM in explaining the observed stock returns in the Athens Stock Exchange.

#218: **Forecasting Euro area private consumption using economic sentiment indicators**

Presenter: Tatiana Cesaroni@Tresury ministry of economy and finance, Italy

The empirical literature on monitoring and forecasting consumption, mainly focuses on the use of consumer confidence indicators to improve short term forecasts. The aim of this paper is to provide accurate forecasts of Euro Area private consumption using economic sentiment indicators coming from European Commission tendency surveys. Economic sentiment indicators are largely used as short run policy indicators since they act as leading indicators of the aggregate economic situation. For this reason this paper explores whether considering Euro area economic sentiment indicator can furthermore improve short term private consumption forecasts. To this end we compare the out of sample forecasting performance of different VAR models. The results show that the specification including the euro area economic sentiment indicator gives better outcomes in terms of RMSE criteria than that one comprising traditional consumer confidence indicator. The use of quantitative data such as retail trade and car registrations also helps to forecast consumption but only in specifications including sentiment indicators.

CS35 Room: B103 COMPUTATIONAL ECONOMETRICS - 2 Chair: Lynda Khalaf

#234: **Bootstrapping methods for causal analysis of time series data**

Presenter: Roy Nitze@Bielefeld University, Germany
Co-authors: Pu Chen

There have been several proposals for searching within certain classes of causal structures, which can circumvent known problems by adopting methods from the artificial intelligence and machine learning literature (e.g. Pearl's method for analysis and representation of recursive systems by directed acyclical graphs). These methods seek to reveal an influence structure between the members of a set of variables by successively testing for conditional independencies. From the accepted and rejected independence findings a network of presumed causal relations is formed and a joint probability distribution thereby represented is determined afterwards. A heuristic and most frequently approximate search through the space of candidate networks should give the structure with the most similar joint distribution. The promising concept of these approaches is sometimes undermined by the fact that they assume i.i.d. observations of the considered variables. In macroeconomics we usually have to deal with observations of random variables for only one or — at most — a few agents. Thus there is time structure in the data which has a meaning of its own in explaining the progress of the system and therefore must not be ignored in the process of causal analysis. Alternatively one can regard the whole set of observations as a sample of size 1 from the true underlying joint distribution. This would entirely preserve the information concerning the time dimension but the causal structure itself cannot be estimated due to lack of observations. Instead we suggest a way to reach both: retaining time structure and sufficient sample size. By the assumption that each directed influence between members of a set of variables dies out or reduces to an insignificant size after a finite number of periods, blocks of consecutive observations can be choosen, that contain the relevant time structure as well as the "other" causal influences. Bootstrapping these blocks delivers a sample of reasonable size for the purpose of finding the best network in the sense outlined above. The basic approach is extended by relaxing the functional form of classical linear models to generalized linear/additive models which allow for a wider range of causal dependence. An empirical application of the methods with monetary policy data completes the outline of capabilities of our approach and suggests further lines of research concerning the complexity of most economic phenomena.

#77: **Finite sample properties of the dependent bootstrap for conditional moment models**

Presenter: Rachida Ouysse@University of New South Wales, Australia

Motivated by the tractability of its asymptotic properties and its ease of implementation, GMM was previously introduced for estimation and inference in nonlinear rational expectation models. This paper examines the extent of size distortion of the asymptotic approximation and investigates the small sample refinements of three dependent bootstrap methods in the context of consumption CAPM. We study the distribution of GMM statistic for over identifying restrictions and compare the size distortion under Block-, Markov-, and Stationary bootstrap. We find that the bootstrap outperforms the asymptotic chi-squared approximation regardless of the blocking rule. Using Fast bootstrap methods, we identify empirical patterns in the rejection probability as a function of sample size, block size and nominal level. We find that the Stationary bootstrap is almost always dominated by the Block bootstrap. Although the Stationary bootstrap enjoys relatively low sensitivity to the choice of block length, this advantage diminishes with sample size and number of instruments.

#62: **In-sample and out-of-sample bias in large scale data mining: evidence from trading rule performance**

Presenter: Qingwei Wang@ZEW GmbH, Germany
Co-authors: Pei Kuang, Michael Schroder

Classical tests usually find more than 3,000 profitable trading rules from a universe of 25,988 strategies, but on average less than 10 remain significant after correcting for data snooping bias. We show this by implementing two stepwise bootstrap tests which formally account for the data snooping bias. These tests enable us to show how many satisfactory results are genuine and how many are spurious. Our findings indicate rare evidence against the efficiency of emerging FX markets. These findings are robust to the inclusion of transaction costs, subsample analysis and smaller universes of trading rules.

#247: **Robust discriminant analysis based on partial least squares methods**

Presenter: Emilio Leton@Universidad Carlos III de Madrid, Spain
Co-authors: Daniel Pena, Rosario Romera

PLS was originally designed in the context of the prediction of q ($q \geq 1$) outcomes quantitative variables Y, in terms of p ($p \geq 1$) explanatory quantitative variables X, to cope with the case $n \gg p$ and/or the presence of multicollinearity, being n the sample size. The first application of PLS was done in multivariate time series modeling. In the last decade PLS has been used in discrimination problems, using dummy variables for the univariate response. This use is justified by the relationship between PLS and LDA. However, with multicollinearity and/or $n \ll p$, the algorithms used for PLS (NIPALS, SIMPLS, etc.) are not robust in the presence of outliers. So, several robust PLS procedures have been proposed in the literature. In this paper, we propose a new robust PLS method for discrimination by applying previous results for computing a robust estimate of the covariance matrix. This approach is done by searching for outliers in univariate projections of the data, combining random directions (based on Stahel-Donoho estimator) and specific directions obtained maximizing and minimizing the kurtosis coefficient of the projected data. To illustrate our proposed method we present results from Monte Carlo experiments and real data sets already analyzed by other authors.

CS39 Room: AUM FINANCIAL ECONOMETRICS - 3 Chair: Marc Paolella

#205: **Response surface estimates for the augmented Dickey-Fuller test with lag optimization**

Presenter: Pui Sun Tam@University of Macau, Macau

In applying the popular Dickey-Fuller (DF) test for unit root testing, an issue that arises is the finite-sample distribution of the test deviates from the asymptotic counterpart. Response surface estimates for the test and its augmented version (ADF) have been provided in the literature for calculating critical values for any sample size and fixed lag order. However, it has been recently demonstrated that the finite-sample distribution of the ADF test is sensitive to the lag optimization method employed, and the test suffers from size distortion when the common practice of combining a lag optimization rule in testing equation with the currently available critical values for hypothesis testing is followed. We further demonstrate that the same problem pertains to the panel test version when lag orders are optimized in individual testing equations and moments with fixed lag order are used in standardization. We add to the literature by providing a response surface analysis of the ADF test with lag optimization based on various commonly adopted data-dependent methods, thus making available relevant critical values and moments for empirical researchers in drawing more reliable statistical inference on time series and panel data.

#128: **Bias calculation and corrections of hccmes**

Presenter: Mehmet Orhan@Fatih UN, Turkey
Co-authors: Asad Zaman

It is well known that the classical Eicker(1963)-White(1980) HCCME (EW) is biased (Chesher and Jewitt (1987)) in small samples, and several alternatives have been suggested in literature. The comparison of these HCCMEs under different settings is inevitable but the complexity of the problem has inhibited analytical calculations, that is why most studies have relied on simulations. MacKinnon and White (1985) have compared HCCMEs with simulation and concluded that the jackknife estimator had outperformed the others. Orhan and Zaman (2000) increased the number of HCCMEs and comparison criteria but their method had also relied on computer simulation. This paper is an attempt to compare the biases of the prominent HCCMEs in a simple regression setup, and proves that the orders of the biases are decremented by one when bias correction is applied. We have selected the jackknife estimator of Efron (JA) (1980) and the HCCME introduced by Horn, et al (1975) (JA) to focus on, since they have outperformed the others in our preliminary studies. We make use of Taylor's Expansion to approximate the biases of JA and HD, and prove the improvement by bias correction. Finally, we establish confidence intervals constructed with HCCMEs and their bias corrected versions to demonstrate how close these estimates to the true values are.

#206: **Testing for right, left and overall excess kurtosis in financial variables**

Presenter: Anna Maria Fiori@University of Milano-Bicocca, Italy

Despite its widespread usage, the conventional test statistic for leptokurtosis (gamma2 in standard notation) suffers from various weaknesses. Based on the standardized fourth moment, gamma2 is extremely sensitive to tail outliers and is not easily interpreted, particularly in the asymmetric case. In this study, we suggest alternative tests for right, left and overall excess kurtosis. Based on a kurtosis curve, the tests apply to both symmetric and asymmetric distributions, their interpretation is clear and they presume the existence of first moments only. Applications to daily asset returns (market indices and individual stocks) show that the proposed tests give both a more reliable and a more sophisticated picture of the kurtosis risk embedded in the data

CS40 Room: E003 MULTIVARIATE FINANCIAL ECONOMETRICS Chair: Yasuhiro Omori

#232: **Tests for vector error correction model when the errors are heteroscedastic**

Presenter: Hamdi Raissi@University of Lille 3, France

We study the asymptotic behaviour of the reduced rank estimator of the cointegrating space for vector error correction time series models with dependent and heteroscedastic innovations. We also consider estimators of the adjustment and short run parameters in this framework. It is shown that the distribution of the estimators of the adjustment space and of the short run parameters can be different for models with iid innovations and models with dependent heteroscedastic errors. We propose a portmanteau test for checking the adequacy of the autoregressive order which is adapted in our framework. We also study the asymptotic behaviour of the standard likelihood ratio test (LR) statistic to test the cointegrating rank. It is shown that the test statistic for the cointegrating rank have the same asymptotic distribution as for in the standard case when the errors are moderately heteroscedastic. We study the finite sample performance of the tests by mean of Monte Carlo experiments.

#233: **Monetary policy interdependence between the ECB and the Fed: the Taylor rule based VARX and VECM**

Presenter: Yuhua Cui@University of Hohenheim, Germany
Co-authors: Ansgar Belke

In this paper, we analyse the monetary policy interdependence between the European Central Bank (ECB) and the Federal Reserve (Fed) for the period 1999-2006. Two models are specified for empirical tests: a VAR with exogenous variables (VARX) and a vector error correction model (VECM). In the VARX model, we look for a long-run interdependent relationship between the interest rates of the two currency areas, and specify the Taylor Rule terms as exogenous variables. In the VECM, we regard all the variables as endogenous, and look for long-run equilibrium relationships among them, which may reveal monetary policy

interdependence. Weak exogeneity is checked in both models for a possible leader-follower relationship. The empirical results of both models indicate interdependence between the dollar and the euro interest rates, but only the VECM further more testifies a leader-follower pattern between the ECB and the Fed.

#154: **Is double trouble. How to combine cointegration tests**

Presenter: Christoph Hanck@Universiteit Maastricht, Netherlands
Co-authors: Christian Bayer

This paper suggests a combination procedure to exploit the imperfect correlation of cointegration tests to develop a more powerful meta test. To exemplify, we combine system based and residual based tests. Either of these underlying tests can be more powerful than the other one depending on the nature of the data-generating process. The new meta test is at least as powerful as the more powerful one of the underlying tests irrespective of the very nature of the data generating process. At the same time, our new meta test avoids the size distortion inherent in separately applying multiple tests for cointegration to the same data set. An application of our procedure to a large set of published cointegration tests illustrates the practical usefulness of our approach.

#178: **A no arbitrage fractional cointegration analysis of range based volatility**

Presenter: Eduardo Rossi@University of Pavia, Italy
Co-authors: Paolo Santucci de Magistris

It is well known that the spot and the future prices are related by a no arbitrage assumption. In this paper, we show that the no arbitrage assumption implies a particular relationship between the volatility of the spot and future prices. We consider the range based volatility measure, that is equal to the difference between the highest and the lowest log-price of a given day, obtaining a no arbitrage equilibrium relationship between the future and the spot ranges. Moreover,we note that this relation is valid for any unbiased integrated volatility estimator, such as realized volatility. The aim of this paper is twofold. First, we investigate the no arbitrage relation between the volatilities of spot and future prices, exploiting the Parkinson's estimator as a non parametric daily volatility measure. We analyse the long memory property of the range-based volatility estimators, and we run a test to verify the possibility of fractional cointegration, that is a generalization of the concept of cointegration to any process of order d, between the logarithms of spot and forward volatilities. We follow the approach presented by Christensen and Nielsen, that develop a two step procedure when the processes are stationary with long memory, i.e. when the fractional integration order is between 0 and 1/2. Second, we propose to model the dynamics of the two series via a fractionally integrated vector error correction model (the FIVECM model), in order to explicity consider the no arbitrage relation in a bivariate model for the spot and future volatilities.

CS41 Room: B104 ECONOMETRIC APPLICATIONS Chair: Christian Francq

#133: **Semiparametric stochastic frontier models for clustered data**

Presenter: Luca Grassetti@University of Udine, Italy
Co-authors: Ruggero Bellio

The theory of stochastic frontier functions for panel or clustered data have been traditionally based on a parametric approach, leading in many cases to overparameterized model specifications. Though some nonparametric and semiparametric approaches have been proposed, most of the existing proposals exhibit some lack of model interpretability. The present work aims to gain some degree of interpretability of the results, allowing for flexible specification of the deterministic component of the model. Here the flexibility is introduced as an additive term in a classical frontier model specification, following the modern approach of mixed-model formulation of semiparametric regression. The approach employs suitable spline bases for building a flexible specification of the production (or cost) function, where the coefficients of the bases are normal random effects. The frontier model specification is then completed by an asymmetric error component. In the present work this term is assumed to have a half-normal distribution, leading to a closed skew-normal distribution for the response. Finally, the coefficient of the model are estimated by maximum likelihood, and the random effects estimated by a BLUP-type procedure. The method is assessed by means of a Monte carlo study, and illustrated by an empirical application with real data about hospital productivity.

#47: **Health and (other) assets holdings**

Presenter: Pascal St-Amour@University of Lausanne, Switzerland
Co-authors: Julien Hugonnier, Florian Pelgrin

Empirical research has highlighted strong links between the health status and the financial one. Healthy agents tend to be wealthier, with correlation running both ways. Moreover, agent in poor health reduce the riskiness of their portfolios on favor of safer assets. Although these empirical facts have been well-established, their theoretical foundations are not well understood. This paper focuses on an asset allocation problem in which the agent can invest in his health with a positive impact on his survival probability and labor income. We characterize quasi-reduced form expressions for the optimal portfolio, consumption and investment in health. We show that a better health reduces risk aversion at the optimum and induces more risky portfolios. Our model is estimated structurally and reproduces many other salient features of the data.

#84: **DSGE model of a small open economy: France**

Presenter: Nabil Ben Arfa@University of Nice Sophia-Aantipolis, France

In this paper we asses the effects and the transmission mechanisms of productivity shocks and imported energy shocks on the

macroeconomic variables of a small open economy, France. We use a DSGE model for the French economy, and proceed in several steps. As a starting point we study the cyclical features of the French economy, those of its main trading partners and the USA; this exercise enables us to make comparisons between France and its European neighbours. Once the facts are established, we describe the model and its equations, check the steady state and calibrate the parameters, analyse the impulse response function and the variance decomposition. Finally, we compare the statistical moments of order two of the model with those related to the real facts in order to assess the validity of the model. It appears from our investigations, that the French cyclical characteristics have a significant correlation with those of its main neighbours (Germany, Spain and Italy) which means that these countries have a synchronized business cycle, and are probably hit by symmetric shocks. The France economy is also more vulnerable to technology shocks than to imported energy shocks. Indeed, productivity shocks explain 86 percent of output fluctuations whereas imported energy shocks are only able to explain 14 percent. Imported energy shocks seem to be negligible as a source for French business cycle.

Author index