Scientific Program
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<th>Time</th>
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<tr>
<td>8:00am - 8:30am</td>
<td>Registration</td>
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<tr>
<td>8:30am - 9:30am</td>
<td>P1: Plenary 1</td>
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<td>Session Chair: Brian D Anderson, The Australian National University</td>
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<tr>
<td>9:30am - 10:00am</td>
<td>Coffee Break</td>
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<tr>
<td>10:00am - 12:00pm</td>
<td>S01: Session 1</td>
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<td>Session Chair: Christian Kascha, University of Zurich</td>
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<td>10:00am - 12:00pm</td>
<td>S02: Session 2</td>
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<td>Session Chair: Pooyan Amir Ahmadi, Goethe University Frankfurt</td>
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<td>12:00pm - 1:30pm</td>
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<td>1:30pm - 1:40pm</td>
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<td>1:40pm - 2:30pm</td>
<td>P2: Plenary 2</td>
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<td>Session Chair: Sylvia Frühwirth-Schnatter, WU University of Economics and Business</td>
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<td>2:30pm - 3:00pm</td>
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<td>3:00pm - 4:30pm</td>
<td>S03: Session 3</td>
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<td>Session Chair: Gregor Kastner, WU Vienna University of Economics and Business</td>
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<td>3:00pm - 4:30pm</td>
<td>S04: Session 4</td>
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<td>Session Chair: Josu Arteche, University of the Basque Country UPV/EHU</td>
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<td>5:00pm - 6:00pm</td>
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<td>Session Chair: Elisabeth Felsenstein, TU Wien</td>
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<tr>
<td>8:00pm - 10:00pm</td>
<td>Conference Reception - Vienna City Hall</td>
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## Date: Friday, 03/May/2013

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<tr>
<td>8:30am - 9:30am</td>
<td>P4: Plenary 4</td>
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<td>Session Chair: Wolfgang Scherrer, Technische Universität Wien</td>
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<td>10:00am - 12:00pm</td>
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<td>Session Chair: Bernd Funovits, University of Vienna</td>
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## Date: Saturday, 04/May/2013

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<td>Session Chair: Sylvia Kaufmann, Study Center Gerzensee</td>
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<td>10:30am - 11:30am</td>
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<td>Session Chair: Manfred Deistler, Vienna University of Technology and IHS</td>
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Presentations

P1: Plenary 1

Time: Thursday, 02/May/2013: 8:30am - 9:30am · Location: HS 2
Session Chair: Brian D Anderson, The Australian National University

P1: 1

Detection of structural breaks in multivariate time series

Holger Dette
Ruhr-Universität Bochum, Germany; holger.dette@rub.de

We propose a new nonparametric procedure for the detection and estimation of multiple structural breaks in the autocovariance function of a multivariate (second-order) piecewise stationary process, which also identifies the components of the series where the breaks occur. The new method is based on a comparison of the estimated spectral distribution on different segments of the observed time series and consists of three steps: it starts with a consistent test, which allows to prove the existence of structural breaks at a controlled type I error. Secondly, it estimates sets containing possible break points and finally these sets are reduced to identify the relevant structural breaks and corresponding components which are responsible for the changes in the autocorrelation structure. In contrast to all other methods which have been proposed in the literature, our approach does not make any parametric assumptions, is not especially designed for detecting one single change point and addresses the problem of multiple structural breaks in the autocovariance function directly with no use of the binary segmentation algorithm. We prove that the new procedure detects all components and the corresponding locations where structural breaks occur with probability converging to one as the sample size increases and provide data-driven rules for the selection of all regularization parameters. The results are illustrated by analyzing financial returns, and in a simulation study it is demonstrated that the new procedure outperforms the currently available nonparametric methods for detecting breaks in the dependency structure.
S01: Session 1

**Forecasting VARs, Model Selection, and Shrinkage**

*Christian Kascha*\(^1\), *Carsten Trenkler*\(^2\)

\(^1\)University of Zurich, Switzerland; \(^2\)University of Mannheim, Germany; christian.kascha@econ.uzh.ch

In the last decade, various shrinkage estimation and/or selection methods such as the LASSO have become popular in the statistical literature. However, there is limited evidence on the forecasting performance of these methods for vector autoregressive (VAR) models, apart from evidence on the performance of Bayesian shrinkage. In particular, we do not know when there is a difference between these methods, which strategy is likely to work best under which circumstances and how to these methods work in interaction with other specification choices such as the size of the VAR and its lag length. This paper tries to fill part of this gap by comparing the forecast performance of (i) traditional selection methods (ii) regularization methods and (iii) empirical Bayesian methods for a quarterly US data set.

Our main results are as follows. We find that an expanding estimation window combined with cross-validation for determining the tuning parameters of the models work best in our context, even though other choices do not yield very different results. There was no method that worked best under all circumstances, however, traditional selection methods such as top-down selection or sequential elimination of regressors were dominated by the other methods. Ironically, the choice of the lag length (estimation method) was often more decisive for forecasting performance than the choice of the shrinkage method. In agreement with the literature, we find that augmenting the system size combined with shrinkage yields considerably better forecasting performance even though we find that these improvements essentially disappear after horizon one.

S01: 2

**Time-Varying Parameter Models-Achieving Shrinkage and Variable Selection**

*Angela Bitto*, *Sylvia Frühwirth-Schnatter*

Vienna University of Economics and Business; abitto@wu.ac.at

Time-varying parameter (TVP) models are a popular tool for handling data with smoothly changing parameters. However, in situations with many parameters the flexibility underlying these models may lead to overfitting models and, as a consequence, to a severe loss of statistical efficiency. This occurs, in particular, if only a few parameters are truly time-varying, while the remaining ones are constant or even insignificant. As a remedy, hierarchical shrinkage priors have been introduced for TVP models to allow shrinkage both of the initial parameters as well as their variances toward zero.

The present paper contributes to the literature in two ways. First, we investigate shrinkage for TVP models based on the Normal-Gamma prior which has been introduced by Griffin and Brown (2010) for standard regression models. Our approach extends Belmonte, Koop, and Korobilis (2011) who considered the Bayesian LASSO prior, a special case of the Normal Gamma prior. While both priors reduce the risk of overfitting and increase statistical efficiency, they do not allow for variable selection. Hence, as a second contribution, we follow Frühwirth-Schnatter and Wagner (2010) and consider TVP models with spike-and-slab priors which explicitly incorporate variable selection both with respect to the initial parameters as well as their variances.

Following Belmonte et al. (2011), hierarchical shrinkage priors as well as spike-and-slab priors are applied to EU area inflation modelling based on the generalized Phillips curve. Since the corresponding time series are relatively short, variable selection through the spike-and-slab priors is particularly sensitive to the choice of hyperparameters.

S01: 3

**Model-Based Clustering of Multiple Time Series with Time-Varying Number of Clusters**

*Yongning Wang*

University of Chicago, United States of America; ywang1@chicagobooth.edu

Recently, clustering on multiple time series has attracted much interest as its practical utility has become greater with the increasing availability of datasets composed of many series in fields such as macroeconomics, finance, and marketing. We propose a new state space model to handle clustering of multiple time series with time-varying numbers of groups. We assume that a maximum of K possible hidden groups are present. The number of groups has the Markov property and its evolution is represented by a transition probability matrix. Considering the complexity of computation and real application, we assume that the number of clusters can change by at most 1 each time.

For time periods with the same number of groups, same econometric model holds within each group. The models we consider include AR(p) models with dependence on exogeneous variables. Hence during these time periods, information from those time series in the same group can be pooled for estimation. We estimate the number of groups, the clustering of time series, and the group-specific model parameters simultaneously using Markov chain Monte Carlo methods. Our approach is related to the model-based clustering approach of Frühwirth-Schnatter and Kaufmann (2008) and is an extension of their method.

We use simulated multiple time series to examine the statistical efficiency and forecasting performance of the proposed method. Simulation studies demonstrate that our approach performs well on data generated with both time-varying and constant number of groups. To illustrate the usefulness of the approach, we provide an empirical application on the monthly differenced unemployment rate data of the 50 U.S. states from January 1976 to September 2011. We find three regimes of number of groups, with each regime representing different conditions of the unemployment rates over the whole country. In the regime with only one cluster, all the individuals move in tandem with a low volatility. In the regimes with more than one group, the first group always represents the overall trend, and the states with larger volatility in the differentiated rates are in another group. For example in the third regime, the largest and the smallest values of changes in the sample (6.3% and -5%), which come from Louisiana during the period of Hurricane Katrina, both belong to the second group from the result of Bayesian classification. Out-of-sample forecasting of our method is obtained and compared with other approaches available in the literature, and a good performance is illustrated. The results show the importance of considering the time-varying effect in the number of groups for time series clustering.
The macroeconomic impact of economic uncertainty: A common factor analysis

Steffen Henzel\textsuperscript{1}, Malte Rengel\textsuperscript{2}

\textsuperscript{1}Ifo Institute, Germany; \textsuperscript{2}University of Goettingen; mrengel@uni-goettingen.de

Uncertainty about the future course of economic variables appears in almost all economic areas and is an important driving force behind business cycle fluctuations. As uncertainty is inherent in the movements of literally hundreds of economic variables, it is unknown how many distinct (fundamental) types of uncertainty actually exist. We construct a large data set covering measures of all types of economic uncertainty. The fundamental shocks driving the dynamics of economic uncertainty in the US are unraveled. That is, we use a dynamic factor model to reduce the dimension of the uncertainty measures and identify the underlying common factors. It turns out that the dimension of uncertainty is small as there appears to be two fundamental factors. The first factor represents uncertainty related to (domestic) business cycle movements, whereas the second factor contains (international) oil price uncertainty. Finally, we evaluate the importance of each uncertainty factor for business cycle fluctuations.
S02: Session 2

Time: Thursday, 02/May/2013: 10:00am - 12:00pm · Location: SRS
Session Chair: Pooyan Amir Ahmadi, Goethe University Frankfurt

S02: 1

Credit Shocks, Monetary Policy, and Business Cycles: Evidence from a Structural Time Varying Bayesian FAVAR

Pooyan Amir Ahmadi
Goethe University Frankfurt, Germany; amir@econ.uni-frankfurt.de

I estimate a Bayesian factor-augmented vector autoregression model using a large panel of macroeconomic and credit spread data from the United States for the period 1926-2009. The model has time varying parameters and volatilities. I identify a number of episodes with high volatility in the common component of credit spreads. Often, though not always, these episodes coincide with (or lead) NBER recessions. I find that, during these episodes, credit spread shocks and monetary policy shocks have much stronger effects on macroeconomic variables than on average. The degree of amplification of those responses reaches at its peak a factor of up to ten. These amplified responses tend to exhibit a larger persistence.

S02: 2

Keeping a Finger on the Pulse of the Economy: Nowcasting Swiss GDP in Real-Time Squared

Boriss Siliverstovs
KOF ETHZ, Switzerland; siliverstovs@kof.ethz.ch

This study evaluates forecasting performance of a large-scale factor model developed in Siliverstovs and Kholodilin (2012) in a genuine ex ante forecasting exercise. We perform our forecasts of GDP growth in Switzerland in real time using real-time data vintages collected at weekly frequency. This allows us to monitor how newly released economic and financial data influence our forecasts and hence capture prevailing tendencies in the current course of economic development.

S02: 3

Forecasting with Many Models: Model Confidence Sets and Forecast Combination

Rodrigo Sekkel¹, Jon Samuels²
¹Bank of Canada, Canada; ²Bureau of Economic Analysis, U.S.A.; rsekkel@bankofcanada.ca

A longstanding finding in the forecasting literature is that averaging forecasts from different models often improves upon forecasts based on a single model, with equal weight averaging working particularly well. This paper conducts a careful analysis of the effects of trimming the set of models prior to forecast combination based on their historical out-of-sample forecasting performance. We compare different trimming schemes and propose a new one based on the Model Confidence Set (MCS) (Hansen et al. (2011)) that takes into account the statistical significance of historical out-of-sample forecasting performance. In an empirical application of forecasting U.S. macroeconomic aggregates in a data-rich setting, we find significant and robust gains in out-of-sample forecast accuracy from our proposed trimming method. Models including interest rate spreads and housing variables are the most frequently selected to be combined when forecasting real activity indicators, whereas for inflation, models that also include labor market indicators are also often chosen. We argue based on Monte Carlo simulations that persistence in forecasting performance and parameter estimation error in small samples provide an explanation for these gains.

S02: 4

New Results on Exact Maximum Likelihood Estimation of Zero Beta Asset Pricing Models

Bernard Hanzon, Andrei Mustata
University College Cork, Ireland; b.hanzon@ucc.ie

In the area of quantitative financial modelling the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) play a prominent role (cf. [3]). These models try to explain common movement of stock price returns using a small number of explanatory factors. As a result of the no-arbitrage principle there are dependency relations between the parameters. When there is no risk-free asset in the market one uses Black's zero-beta portfolio instead of the risk-free asset. From the econometric viewpoint, this leads to a non-linear maximum likelihood estimation problem. Classically the non-linearity is handled by using an iterative algorithm that tries to find the optimum of the likelihood function. However there are apparently no guarantees that the global optimum is found in this way and one will have to choose a stopping criterion which could lead to wrong answers if incorrectly chosen. In the CAPM case Shanken [4], using results of Kandel [5], proposed a simple exact method to calculate the optimum. Here we present a new and simple exact method that finds the global optimum in the APT case with "macroeconomic variables" (not portfolios) as factors. In the first part of the paper our theoretical results are presented. In the final part we will report on the results obtained by applying these methods to simulated and real data.
P2: Plenary 2

Time: Thursday, 02/May/2013: 1:40pm - 2:30pm · Location: HS 2
Session Chair: Sylvia Frühwirth-Schnatter, WU University of Economics and Business

P2: 1

Parallel Time-varying Combinations of Predictive Densities using Nonlinear Filtering

Herman Koene Van Dijk¹, Monica Billio², Roberto Casarin³, Francesco Ravazzolo⁴

¹Erasmus University and VU University, Netherlands, The; ²University of Venice, GRETA Assoc. and School for Advanced Studies in Venice; ³University of Venice, GRETA Assoc. and School for Advanced Studies in Venice; ⁴Norges Bank and BI Norwegian Business School; hkvandijk@ese.eur.nl

We propose a Bayesian combination approach for multivariate predictive densities which relies upon a distributional state space representation of the combination weights. Several specifications of multivariate time-varying weights are introduced with a particular focus on weight dynamics driven by the past performance of the predictive densities and the use of learning mechanisms. In the proposed approach the model set can be incomplete, meaning that all models can be individually misspecified. A Sequential Monte Carlo method is proposed to approximate the filtering and predictive densities. The combination approach is assessed using statistical and utility-based performance measures for evaluating density forecasts of simulated data, US macroeconomic time series and surveys of stock market prices. Simulation results indicate that, for a set of linear autoregressive models, the combination strategy is successful in selecting, with probability close to one, the true model when the model set is complete and it is able to detect parameter instability when the model set includes the true model that has generated subsamples of data. Also, substantial uncertainty appears in the weights when predictors are similar; residual uncertainty reduces when the model set is complete; and learning reduces this uncertainty. For the macro series we find that incompleteness of the models is relatively large in the 70's, the beginning of the 80's and during the recent financial crisis, and lower during the Great Moderation; the predicted probabilities of recession accurately compare with the NBER business cycle dating; model weights have substantial uncertainty attached. With respect to returns of the S&P 500 series, we find that an investment strategy using a combination of predictions from professional forecasters and from a white noise model puts more weight on the white noise model in the beginning of the 90's and switches to giving more weight to the professional forecasts over time. Information on the complete predictive distribution and not just on some moments turns out to be very important, above all during turbulent times such as the recent financial crisis. More generally, the proposed distributional state space representation offers a great flexibility in combining densities.
S03: Session 3

Time: Thursday, 02/May/2013: 3:00pm - 4:30pm · Location: HS 2
Session Chair: Gregor Kastner, WU Vienna University of Economics and Business

S03: 1

Efficient Bayesian Inference for Multivariate Factor Stochastic Volatility Models
Gregor Kastner1, Sylvia Frühwirth-Schnatter1, Hedibert Freitas Lopes2
1WU Vienna University of Economics and Business; 2Chicago Booth School of Business; gregor.kastner@wu.ac.at

Multivariate factor SV models are increasingly used for the analysis of multivariate financial and economic time series because they can capture the volatility dynamics by a small number of latent factors. The main advantage of such a model is its parsimony, where all variances and covariances of a time series vector are governed by a low-dimensional common factor with the components following independent SV models. For high dimensional problems of this kind, Bayesian MCMC estimation is a very efficient estimation method, however, it is associated with a considerable computational burden when the number of assets is moderate to large. To overcome this, we avoid the usual forward-filtering backward-sampling (FFBS) algorithm by sampling “all without a loop” (AWOL), consider various reparameterizations such as (partial) non-centering, and apply an ancillarity-sufficiency interweaving strategy (ASIS) for boosting MCMC estimation at an univariate level, which can be applied directly to heteroscedasticity estimation for latent variables such as factors. To show the effectiveness of our approach, we apply the model to a vector of daily exchange rate data.

S03: 2

COMFORT-CCCClass: A Common Market Factor Non-Gaussian Returns Model
Marc S. Paolella, Pawel Polak
University of Zurich / Swiss Finance Institute, Switzerland; pawel.polak@bf.uzh.ch

A new multivariate time series model with various attractive properties is motivated and studied. By extending the CCC model in several ways, it allows for all the primary stylized facts of financial asset returns, including volatility clustering, non-normality (excess kurtosis and asymmetry), and also dynamics in the dependency between assets over time. A fast EM-algorithm is developed for estimation. The predictive conditional distribution is a (possibly special case of a) multivariate generalized hyperbolic, so that sums of marginals (as required for portfolios) are tractable. Each element of the vector return at time t is endowed with a common univariate shock, interpretable as a common market factor, and this stochastic process has a predictable component. This leads to the new model being a hybrid of GARCH and stochastic volatility, but without the estimation problems associated with the latter, and being applicable in the multivariate setting for potentially large numbers of assets. Formulae associated with portfolio optimization, risk measures and option pricing based on the predictive density are developed. In-sample fit and out-of-sample conditional density forecasting exercises using daily returns on the 30 DJIA stocks confirm the superiority of the model to numerous competing ones.

S03: 3

What makes residential different from non-residential REITs? Evidence from multi-factor asset pricing models
Daniele Bianchi1, Massimo Guidolin1, Francesco Ravazzolo2
1Bocconi University, Milan, Italy; 2Norges Bank, Oslo, Norway; daniele.bianchi@phd.unibocconi.it

We use Bayesian methods to estimate a multi-factor linear asset pricing model characterized by structural instability in factor loadings, idiosyncratic variances, and factor risk premia. We use such a framework to investigate the key differences in the pricing mechanism that applies to residential vs. non-residential (such as office space, industrial buildings, retail property) REITs. Under the assumption that the subprime crisis has had its epicentre in the housing/residential sector, we interpret any differential dynamics as indicative of the propagation mechanism of the crisis towards business-oriented segments of the US real estate market. We find important differences in the structure as well as the dynamic evolution of risk factor exposures across residential vs. nonresidential REITs. An analysis of cross-sectional mispricings reveals that only retail, residential, and mortgage-specialized REITs have been over-priced over the initial part of our sample, i.e., 1999-2006. However, the strongest mispricings occurred and may be still persisting in the office and regional mall-specialized REIT subsectors.
S04: Session 4

**Time:** Thursday, 02/May/2013: 3:00pm - 4:30pm  ·  **Location:** SRS
**Session Chair:** Josu Arteche, University of the Basque Country UPV/EHU

**S04: 1**

**Signal Extraction in Long Memory Stochastic Volatility**

Josu Arteche  
UPV/EHU, Spain; josu.arteche@ehu.es

Long Memory in Stochastic Volatility (LMSV) models are flexible tools for the modelling of persistent dynamic volatility, which is a typical characteristic of financial time series. However, its empirical applicability is limited because of the complicated estimation of the model and extraction of the volatility component. The paper at hand proposes a new technique of volatility extraction, based on a semiparametric version of the optimal Wiener-Kolmogorov filter in the frequency domain. Its main characteristics are its simplicity and generality, because no parametric specification is needed for the volatility component and remains valid for a stationary and nonstationary signal. The applicability of the proposal is shown in a Monte Carlo and in a real series of daily Dow Jones Industrial index.

**S04: 2**

**Sudden Changes in the Structure of High-dimensional Time Series**

Jürgen Franke¹, Marc Fiecas², Rainer von Sachs³, Joseph Tadjuidje Kamgaing¹  
¹University of Kaiserslautern, Germany; ²UC San Diego, USA; ³Université Catholique Louvain-la-Neuve, Belgium; franke@mathematik.uni-kl.de

Time series, in particular those in finance, sometimes switch from one regime to another, e.g. from a low volatile market to a state with higher risk. In finance, time series of interest are frequently high-dimensional. In that case, standard estimation algorithms for, e.g., Markov switching models, do not work well.

As a first step towards handling those difficulties, we consider a hidden Markov model with high-dimensional conditionally Gaussian data, which may be interpreted as the vector of asset returns from some large portfolio. For that rather simple Markov-switching model, we discuss an approach based on shrinkage combined with an EM algorithm to get more stable estimates of covariance matrices corresponding to the different regimes as well as of the transition matrix of the hidden Markov chain. Additionally, we get more stable filters allowing for the reconstruction of the hidden variables. As an application, we consider US industry portfolio data of dimension 30.

**S04: 3**

**Strictly stationary solutions of ARMA equations in Banach spaces**

Felix Spangenberg  
TU Braunschweig, Germany; f.spangenberg@tu-bs.de

We obtain necessary and sufficient conditions for the existence of strictly stationary solutions of ARMA equations in Banach spaces with independent and identically distributed noise under certain assumptions. First, we obtain conditions for ARMA(1,q) equations by excluding zero and the unit circle from the spectrum of the operator of the AR part. We then extend this to ARMA(p,q) equations. Finally, we discuss various examples.
Measuring Uncertainty

Serena Ng¹, Sydney Ludvigson², Kyle Jurado³

¹Columbia University, United States of America; ²New York University, United States of America; ³Columbia University, United States of America; serena.ng@columbia.edu

A central challenge in the literature on economic uncertainty is the measurement of uncertainty. This paper provides new econometric measures of uncertainty and relates them to macroeconomic activity. Uncertainty is defined as variability in the purely unforecastable component of the future value of a variable, looking forward over some horizon h. Three key ingredients to our measure of uncertainty are: (i) a forecasting model with predictors that span a rich information set, (ii) a stochastic volatility model for the forecast innovation errors, and (iii) a measure of macro uncertainty given by uncertainty factors common to individual measures of uncertainty across a large number of economic time series. Our uncertainty factors uncover three big episodes of macro uncertainty in the post-war period: the 1973-74 and 1981-82 recessions and the Great Recession of 2007-09. Of these, the 2007-09 recession represents the most striking episode of heightened uncertainty since 1960. But these estimates also imply far fewer uncertainty episodes than do popular proxies for uncertainty based on time series and/or cross-section volatility of stock returns, industry-level earnings, or subjective (survey based) forecasts. Nevertheless, the estimated uncertainty factors explain between 5 and 14% of the forecast error variance of industrial production from vector autoregression (VAR) estimates, depending on the VAR forecast horizon. By contrast, stock market volatility—a common proxy for uncertainty—explains between 0 and 6%.
P4: Plenary 4

Time: Friday, 03/May/2013: 8:30am - 9:30am · Location: HS 2
Session Chair: Wolfgang Scherrer, Technische Universität Wien

P4: 1

Signal Detection in High Dimension: testing sphericity against spiked alternatives

Marc Hallin¹, Marcelo Moreira², Alexei Onatski³

¹Université libre de Bruxelles and Princeton University, Belgium; ²Fundação Getulio Vargas, Rio de Janeiro; ³University of Cambridge; mhallin@ulb.ac.be

We consider the problem of testing the null hypothesis of sphericity for a high-dimensional covariance matrix against the alternative of (unspecified) of a finite number of symmetry-breaking directions (multispiked alternatives). Simple analytical expressions are derived for the asymptotic power envelope and the asymptotic powers of existing tests. These asymptotic powers are shown to lie very substantially below the envelope. In contrast, the asymptotic power of the likelihood ratio test is shown to be uniformly close to the envelope.
S05: Session 5

Time: Friday, 03/May/2013: 10:00am - 12:00pm · Location: HS 2
Session Chair: Bernd Funovits, University of Vienna

S05: 1

Identifiability of regular and singular multivariate autoregressive models from mixed frequency data, part 1
Elisabeth Felsenstein1, Bernd Funovits2, Manfred Deistler2, Brian D. O. Anderson3, Mohsen Zamani4, Weitian Chen4
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This paper is concerned with identifiability of an underlying high frequency multivariate AR system from mixed frequency observations. Of course, mixed frequency data are very likely to occur in high dimensional time series. This is the reason for our interest in singular multivariate AR systems as models for latent variables and static factors in dynamic factor models.

If we have identifiability, the parameters and thus all second moments of the output process can be estimated consistently from mixed frequency data. Then linear least squares methods for forecasting, nowcasting and interpolation of nonobserved output variables can be applied.

The main results show that on a generic subset of the parameter space identifiability holds. The mapping attaching to the second moments the parameters is continuous and thus provides us with consistent estimators for system and noise parameters. We discuss asymptotic properties of these estimators.

Finally, we treat exact interpolation.

S05: 2

Identifiability of regular and singular multivariate autoregressive models from mixed frequency data, part 2
Elisabeth Felsenstein1, Bernd Funovits2, Manfred Deistler2, Brian D.O. Anderson3, Mohsen Zamani4, Weitian Chen4
1Department of Mathematical Methods in Economics, Vienna University of Technology, Vienna, Austria; 2Vienna Graduate School of Economics, University of Vienna; 3Institute for Advanced Studies, Vienna, Austria; 4Research School of Information Sciences and Engineering, Australian National University, Canberra; 5Department of Electrical and Computer Engineering, University of Windsor, Windsor, ON, Canada; elisabeth.felsenstein@tuwien.ac.at

This paper is concerned with identifiability of an underlying high frequency multivariate AR system from mixed frequency observations. Of course, mixed frequency data are very likely to occur in high dimensional time series. This is the reason for our interest in singular multivariate AR systems as models for latent variables and static factors in dynamic factor models. If we have identifiability, the parameters and thus all second moments of the output process can be estimated consistently from mixed frequency data. Then linear least squares methods for forecasting, nowcasting and interpolation of nonobserved output variables can be applied. The main results show that on a generic subset of the parameter space identifiability holds. The mapping attaching to the second moments the parameters is continuous and thus provides us with consistent estimators for system and noise parameters. We discuss asymptotic properties of these estimators.

Finally, we treat exact interpolation.

S05: 3

Bayesian estimation of sparse dynamic factor models with order-independent identification
Sylvia Kaufmann1, Christian Schumacher2
1Study Center Gerzensee, Switzerland; 2Deutsche Bundesbank; sylvia.kaufmann@szgerzensee.ch

The analysis of large panel data sets (with N variables) involves methods of dimension reduction and optimal information extraction. Dimension reduction is usually achieved by extracting the common variation in the data into few factors (k, where k ≪ N). In the present project, factors are estimated within a state space framework. To achieve a parsimonious representation, the N × k factor loading matrix is estimated under a sparse prior, which assumes that either many zeros may be present in each column of the matrix, or many rows may contain zeros. The significant factor loadings in columns define the variables driven by specific factors and offer an explicit interpretation of the factors. Zeros in rows indicate irrelevant variables which do not add much information to the inference. The contribution includes a new way of identification which is independent of variable ordering and which is based on semi-orthogonal loadings.

S05: 4

Dynamic Factor Models, Cointegration, and Error Correction Mechanisms
Matteo Barigozzi1, Marco Lippi2, Matteo Luciani1
1Università libre de Bruxelles, Belgium; 2Università di Roma La Sapienza, Italy; 3London School of Economics and Political Science, UK; matteo.luciani@ulb.ac.be

In this work, we study the Dynamic Factor model (DFM) in the case of non-stationary I(1) variables. In DFM, each observable is the sum of a common and an idiosyncratic component. The vector of the common components is highly singular, i.e. is driven by a number of shocks that is much smaller than its dimension. We use the results of Anderson and Deistler (2008a,b) on singular stationary vectors to generalize the Granger Representation Theorem to singular I(1) vectors. This theorem provides a representation for the DFM when the variables are driven by both common trends and common cycles. We then turn to determining the number of common trends and cycles. It is well known that if a stationary panel admits an approximate factor structure, there are q eigenvalues of the spectral density matrix diverging as the cross sectional dimension increases, while the others stay bounded. If in addition only q - d common shocks have permanent effects on the data, then the spectral density matrix at the zero frequency has only q - d diverging eigenvalues, where d is the number of common cycles.

On the basis of this result, we propose a modified version of the criterion by Hallin and Liška (2007) to test for the number of common trends and common cycles in large panels. The performance of this method is analyzed by means of a simulation study. Finally, estimation is briefly discussed.

S06: Session 6
Unspanned macroeconomic factors in the yield curve

Laura Coroneo¹, Domenico Giannone², Michele Modugno²
¹University of York, United Kingdom; ²ECARES - Universite libre de Bruxelles; laura.coroneo@york.ac.uk

We show that two macroeconomic factors have an important predictive content for government bond yields and excess returns. These factors are not spanned by the cross-section of yields and are well proxied by economic growth and real interest rates.

Boosting the Anatomy of Volatility

Stefan Mittnik¹, Nikolay Robinzonov², Martin Spindler³
¹University of Munich and Center for Quantitative Risk Analysis; ²University of Munich and Center for Quantitative Risk Analysis; ³Max Planck Society, Germany; finmetrics@stat.uni-muenchen.de

Financial–market risk, commonly measured in terms of asset–price volatility, plays a fundamental role in investment decisions and regulation. In this paper, we investigate a new modeling strategy to better understand the forces that drive market risk. We use componentwise gradient boosting techniques to identify financial and macroeconomic factors influencing volatility and to assess the specific nature of that influence. Componentwise boosting is a sequential learning method, which is capable of producing parsimonious models from a, possibly, large number of predictors and—in contrast to other machine learning techniques—gives rise to models whose parameter estimates that be interpreted in a straightforward manner.

Considering a range of potential risk drivers, we apply the approach to derive monthly volatility predictions for stock, bond, commodity, and foreign exchange indices. Comparisons with a common benchmark model show that the approach improves out–of–sample volatility forecasts for medium– and long–run horizons. Moreover, we find that risk drivers affect future volatility in a nonlinear fashion.

Integrated Modified OLS Estimation and Fixed-b Inference for Cointegrating Regressions

Timothy Vogelsang², Martin Wagner¹
¹Technical University Dortmund, Germany; ²Michigan State University; mwagner@statistik.tu-dortmund.de

This paper is concerned with parameter estimation and inference in a cointegrating regression, where as usual endogenous regressors as well as serially correlated errors are considered. We propose a simple, new estimation method based on an augmented partial sum (integration) transformation of the regression model. The new estimator is labelled Integrated Modified Ordinary Least Squares (IM-OLS). IM-OLS is similar in spirit to the fully modified OLS approach of Phillips and Hansen (1990) and also bears similarities to the dynamic OLS approach of Phillips and Loretan (1991), Saikkonen (1991) and Stock and Watson (1993), with the key difference that IM-OLS does not require estimation of long run variance matrices and avoids the need to choose tuning parameters (kernels, bandwidths, lags). Inference does require that a long run variance be scaled out, and we propose traditional and fixed-b methods for obtaining critical values for test statistics. The properties of IM-OLS are analyzed using asymptotic theory and finite sample simulations. IM-OLS performs well relative to other approaches in the literature.

Cholesky-Factor Regularization Method for Estimating a VAR Volatility Model

Peter Zadrozny¹, Stefan Mittnik², Klaus Wohlrabe³
¹Bureau of Labor Statistics, United States of America; ²Ludwig-Maximilian University, Munich, Germany; ³Ifo Inst. for Econ. Research, Munich, Germany; zadrozny_p@bls.gov

A single estimated multivariate volatility model -- but not several estimated univariate volatility models -- yields desired predicted residual cross-covariances or crossvolatilities, \( E_{ij}(a,\mu,\lambda,\pi, H) \). However, usual multivariate volatility models (VEC, BEKK; Bauwens et al., 2006) have the following nonlinear estimation problems: (1) Simultaneous nonlinear estimation of many parameters of a large model is practically infeasible. (2) Maintaining positive definite (PD) volatility matrices (VM) complicates estimation and constrains the models’ abilities to fit data. For example, VEC model parameters must be constrained in order to ensure that the VM are PD. (3) Prior data analysis, useful for quickly and effectively determining an appropriate model for given data, is difficult in nonlinear estimation of a multivariate model.

The present method overcomes these problems: (1) Proposes linearly (OLS, GLS) estimating a multivariate data model and subsequent volatility model, both of which could be linear dynamic-factor models derived by applying principal components analysis (Stock-Watson, 2002). (2) Proposes estimating a volatility model in terms of Cholesky factors derived from outer products of residuals of a data model, which usually automatically implies PD volatility matrices, i.e., without further constraints on the volatility model. (3) Allows standard prior data analysis of the Cholesky factors before estimating a volatility model for them, such as in Box-Jenkins (1976).
**POSTER: 1**

**Comparing the Accuracy of Copula-Based Multivariate Density Forecasts in Selected Regions of Support**

Valentyn Panchenko¹, Cees Diks², Oleg Solokinsky³, Dick van Dijk⁴

1UNSW, Australia; ²University of Amsterdam; ³Rutgers Business School-Newark and New Brunswick; ⁴Erasmus University of Rotterdam; v.panchenko@unsw.edu.au

This paper develops a testing framework for comparing the predictive accuracy of copula-based multivariate density forecasts, focusing on a specific part of the joint distribution. The test is framed in the context of the Kullback-Leibler Information Criterion, but using (out-of-sample) conditional likelihood and censored likelihood in order to focus the accuracy on the region of interest. Monte Carlo simulations document that the resulting test statistics have satisfactory size and power properties in small samples. In an empirical application to daily exchange rate returns we find evidence that the dependence structure varies with the sign and magnitude of returns, such that different parametric copula models achieve superior forecasting performance in different regions of the support. Our analysis highlights the importance of allowing for lower and upper tail dependence for accurate forecasting of common extreme appreciation and depreciation of different currencies.

**POSTER: 2**

**Robustness and Computation of Spillover Measures for Financial Asset Returns and Volatilities**

Stefan Klößner, Sven Wagner

Saarland University, Germany; S.Kloessner@mx.uni-saarland.de

With financial markets being more and more linked, modeling and measuring spillovers between markets is an important task that has been given a lot of attention in the literature. A recent contribution to this literature is the one by Diebold & Yilmaz (2009) which defines spillover measures in the context of VAR models. These measures, henceforth called DY measures, build heavily on forecast errors' variance decompositions: for every pair of model variables, the spillover from the first to the second variable is given as the share of the second variable's forecast error variance that can be attributed to (shocks to) the first variable. These directional spillovers can be summarized in a so-called spillover table and, additionally, they can be condensed into a single number, the so-called spillover index. Both these spillover measures, however, come along with a crucial drawback wellknown in the context of variance decompositions: their numerical values depend on the ordering of the variables within the VAR model. In this paper, we analyze the robustness of the DY measures with respect to variable rearrangements, extending the results of Klößner & Wagner (2013): while Klößner & Wagner (2013) focus only on the robustness of the spillover index, i.e. on the maximal and minimal values the spillover index may take, we also give attention to the maximal and minimal entries in a spillover table, i.e. the maximal and minimal spillovers between every pair of variables that may occur when variables are renumerated. These maximal and minimal values are not only useful for assessing the robustness of the DY measures, but they also convey valuable information on linkages between variables: if the maximal spillover between two variables is small, then one may safely state that these variables are not connected, while a large minimal spillover indicates a strong linkage between them. Calculating the maximal and minimal values of the DY measures by brute force is infeasible for large-dimensional systems: for instance, for the return and volatility data considered in Diebold & Yilmaz (2009) which comprise 19 time series, calculating the spillover measures for all 19! ~ 10^17 permutations of the variables would typically take hundreds or thousands of years on a modern computer. To resolve this dilemma, we supplement the algorithm for the spillover index introduced in Klößner & Wagner (2013) with a new algorithm for calculating maximal and minimal entries in spillover tables. Both these algorithms make use of certain algebraic identities to develop divide-and-conquer strategies for recursively solving large-dimensional problems, with the result that the new algorithm takes only about a minute for solving the 19-dimensional problem mentioned above, enabling timely calculation of spillover measures even for a rolling window approach. As an important by-product, the new algorithm delivers the average spillover table as well as the average spillover index, with the average being taken over all rearrangements of the model's variables. As these averaged measures are obviously order-invariant, they are a natural, useful, and fast to compute generalization of the DY measures which we show to behave much better than the generalization introduced in Diebold & Yilmaz (2012). Applying our algorithm to the return and volatility data used in Diebold & Yilmaz (2009), we thoroughly investigate the robustness of the DY spillover measures and find that the DY spillover index is reasonably robust to VAR reorderings while the values for pairwise spillovers between different economies depend heavily on the order in which variables enter the model. Using the new averaged measures, we also find interesting aspects of international economic integration that the DY measures did not reveal: first, spillovers in returns and volatilities are clustered regionally, i.e. return and volatility spillovers are stronger for countries of the same geographic region, and second, spillovers are largest between European countries, reflecting the strong economic integration within Europe.

**POSTER: 3**

**Global Macroeconomic Uncertainty**

Tino Berger¹, Sibylle Herz²

¹University of Muenster, Germany; ²University of Cologne; sibylle.herz@wiwi.uni-muenster.de

There is a growing literature that focusses on the impact of nominal and real uncertainty on a country's macroeconomic performance. As one of the first Bloom (2009) investigated uncertainty and its role as a potential impulse driving business cycles. He finds that uncertainty seems to play a potentially important role in business cycles as high uncertainty leads firms to delay their decisions on investment and hiring and that economic slow downs could be driven by a combination of first and second moment shocks. Using various measures of uncertainty Bloom et al. (2011) show that shocks to uncertainty lead to a temporary fall in output and investment. Empirical research on the topic has focused on estimating macroeconomic uncertainty and its potential impact on macroeconomic performance on a national level. Thereby no attention is paid on the potentially important global aspect of the trade-off between uncertainty and macroeconomic performance. We know that macroeconomic variables are highly correlated over developed countries and there exists a rich literature on comovement of macroeconomic variables. Less attention has been paid on the correlation of uncertainty. But an increase in US inflation uncertainty may not only affect macroeconomic variables in the US but may have an impact on other countries as well. Regarding the discussion about the great recession the exposure of countries to global risk or the transmission of uncertainty is an important feature.
Countries were affected by the great recession although some of those countries did not even have strong financial linkages to the US. Some of them were affected even stronger than the US where the recession started. Transmission channels of the Great recession are not fully understood by now, but it seems, there can be identified two categories of transmission mechanisms, a direct contagion effect via first moment correlation and an indirect contagion through the impact of second moments. Regarding the latter effect, Bacchetta and van Wincoop (2010) provide a solution for those phenomena developing a model that explains a simultaneous increase in risk across different countries via the transmission of financial uncertainty. Uncertainty is often related to financial variables, but there exists also a growing literature arguing that uncertainty matters for business cycles. This paper estimates a measure for global macroeconomic uncertainty and analyzes its impact on individual countries' macroeconomic performance. For this purpose we set up a dynamic factor model (DFM) that decomposes inflation and output growth into country-specific and global components. The conditional variances of all factors are modeled as GARCH processes and interpreted as reflecting uncertainty or risk in the underlying factor. Thus we can distinguish between country-specific and global uncertainty. The contribution of the paper is twofold. First, as its main contribution this paper provides an extension to the discussion about the importance of real and nominal uncertainty for macroeconomic performance. Specifically, we separate the effect of country-specific risk from the effect of global risk for the conditional mean of inflation and output growth. The identification of a global dimension of risk and its impact compared to country-specific risk on the outcome of macroeconomic variables is of interest especially regarding the increasing integration of real and financial markets. To the best of our knowledge this point has not yet been analyzed in the literature. Second, this paper contributes to the discussion of the relative importance of common vs. country-specific factors in inflation and output growth. Using a DFM, Kose et al. (2003) interpret the common factor in output growth across countries as the world business cycle and find that it accounts for high shares of volatility in the economic activity of countries. Similarly Ciccarelli and Mojon (2010), Mumtaz and Surico (forthcoming), and Neely and Rapach (2008) focus on the contribution of global inflation to fluctuations in national inflation rates. While there is quite a large literature that estimates common factors in macroeconomic aggregates no effort has been made in estimating a corresponding global risk measure. The DFM employed in this paper allows us to study the time-variation in the conditional second moments of the different factors. Thus we are able to attribute changes in the unconditional variability of output growth and inflation to be either country-specific or global. A decline in the conditional variance of a country specific component can be interpreted as evidence for increased market integration. The prevalent approach to measuring uncertainty in macroeconomic variables is to use the time-varying conditional variance of the series. Typically univariate or bivariate GARCH models are used to model time variation in the conditional variance. In order to test the impact of these uncertainties on the conditional means two approaches have been developed. The simultaneous approach estimates GARCH-in-mean models, in which the conditional variance is included as an explanatory variable in the conditional mean equation. Under the two step procedure the GARCH model is estimated and in a second step Granger-causality tests are performed to test for potentially bi-directional causality. Grier and Perry (1998) use the two-step approach to test for the direction of causality between average inflation and its uncertainty. Applying the same approach but estimating bivariate GARCH models Fountas et al. (2006), and Fountas and Karanasos (2007) investigate possible effects between inflation and output growth and its respective uncertainties. Grier et al. (2004), and Bredin and Fountas (2009) use GARCH-in-mean models of inflation and output growth to investigate such effects.

POSTER: 4
A structural dynamic factor model for the effects of monetary policy estimated by the EM algorithm
Lasse Bork
Aalborg University, Denmark; bork@business.aau.dk
This paper applies the maximum likelihood based EM algorithm to a large-dimensional factor analysis of US monetary policy. Specifically, economy-wide effects of shocks to the US federal funds rate are estimated in a structural dynamic factor model in which 100+ US macroeconomic and ...financial time series are driven by the joint dynamics of the federal funds rate and a few correlated dynamic factors. This paper contains a number of methodological contributions to the existing literature on data-rich monetary policy analysis. Firstly, the identification scheme allows for correlated factor dynamics as opposed to the orthogonal factors resulting from the popular principal component approach to structural factor models. Correlated factors are economically more sensible and important for a richer monetary policy transmission mechanism. Secondly, I consider both static factor loadings as well as dynamic factor loadings, which is important for the response heterogeneity. Thirdly, the monetary policy rate is not a latent factor representation but measured without error and interacts dynamically with the factors in the estimation. Finally, the dynamic factor model is estimated by the one-step maximum likelihood based EM algorithm as an alternative to Bayesian methods and two-step principal component methods. Based on a large panel from 1959:01 to 2012:06 I estimate a number of model specifications and ...find that the dynamic responses of a monetary policy shock are theoretically more plausible for sufficiently rich factor models compared to the response implied by standard SVAR models. For instance, I do not observe the price puzzle in the dynamic factor model implying that after a contractionary shock prices fall.

POSTER: 5
Short-Term Forecasting of Bulgarian GDP Using a Generalized Dynamic Factor Model
Petra Stefanova Rogleva
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In the present paper we utilize the Generalized Dynamic Factor Model proposed by Forni et al. [2002] to construct a short-term forecast of the real GDP in Bulgaria using a large data set of 140 indicators from all sectors of the economy. A simple method is described for selecting a smaller subset of data series that provides better forecasts. Even in this case the number of variables used for the forecasts is still much higher than that in the classical multivariate time series models. The latest available observations of the series with smaller publication delay are also exploited to capture the most recent developments in the economy.

POSTER: 6
Directional Identification for Bayesian Analysis of Dynamic Factor Models
Christian Aßmann1,2, Jens Boyesen-Hogrefe3, Markus Pape4
1National Educational Panel Study, Bamberg, Germany; 2Otto Friedrich University Bamberg, Germany; 3Kiel Institute for the World Economy, Germany; 4Christian Albrechts University Kiel, Germany; markus.pape@stat-econ.uni-kiel.de
For Bayesian estimation, directional identification in factor models is typically obtained by ex ante parameter restrictions. This strategy, however, may result in posterior distributions with shapes that depend on the ordering of cross-sections in the data set. An alternative
approach relies on a sampler without the usual identifying constraints for pure static factor models. Unique estimates are reached ex-post based on a Procrustes transformation. This paper develops an ex-post approach for Bayesian estimation of dynamic factor models for time series data. The properties of this approach are illustrated in a simulation study and an application with macroeconomic data.

POSTER: 7

Forecasting Aggregates Using Disaggregate Information: Does boosting or factor approach help to exploit high-dimensional data?

Jing Zeng
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The issue of forecasting aggregates (direct method) or combining disaggregate forecasts (indirect method) has already been discussed and analyzed in an early contribution by Marcellino et al. (2003) who point out that pooling disaggregate forecasts outperforms direct forecasting of the Euro area aggregates. Hubrich (2005), however, argues that due to differences in the disaggregate series it is not necessarily better to employ the indirect rather than the direct forecasting method. Even asymptotic theory provides inconclusive results regarding the ranking of these two approaches. In the course of further developments in this discussion Hendry and Hubrich (2006, 2011) show analytically that including disaggregate information or variables in the direct forecasting model should be helpful. However, the selected disaggregated variables or information set are an important determinant of the forecast accuracy. So they do not find strong support to their theoretical results in the empirical analysis due to the effect of changing collinearity between regressors selected in the direct aggregate forecasting model. In our work we focus on how to include the disaggregate information or the relevant disaggregate variables in the direct forecasting model. As the prominent approach of dealing with high-dimensional data the factor method which summarizes the information contained in a large number of series in just a few common factors is considered. Additionally, this paper introduces the componentwise boosting algorithm as a method of selecting relevant disaggregate variables from a large dataset. Boosting stems from the machine learning literature and has proven to be very competitive in terms of prediction accuracy (Bühlmann and Hothorn, 2010). The componentwise boosting algorithm estimates an unknown prediction function iteratively and adds the variable with the largest contribution to the fit in each iteration. It treats the lags of one predictor as separate predictors so that variables and lags are selected simultaneously from a large set of candidates for forecasting. We analyze empirically the relative forecast accuracy of the methods considered above as opposed to forecasting aggregate directly and aggregating disaggregate forecasts. The data used in this study include macroeconomic key variables for the Euro area such as the real GDP and the consumer price index from 1970Q1 to 2010Q4. Preliminary results suggest that combining the disaggregate information with the help of the factor model and including the disaggregate variables selected by the componentwise boosting in the direct forecasting model can indeed improve the forecasting performance. It can also be shown that boosting is a viable and competitive alternative to the factor approach in some aspects.

POSTER: 8


Daniel Dimitrov Simeonov1, Tsvetan Stoilov Manchev2, Hristo Atanasov Ivanov3, Christian Hausmann3

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The recent global financial crisis and Euroarea Sovereign Debt Crisis have both been characterized by liquidity failures of certain markets which have reinvigorated the discussions about the importance of measurement and management of liquidity risk. Following these discussions, we also focus on market liquidity (trading) risk – i.e. the risk of trading into illiquid market – in the attempt to quantify and apply practically the formalism of liquidity policy, as described by Acerbi and Scandolo. We propose a comprehensive approach to market liquidity risk through modeling versatility (shiftability) of assets – the cost for shifting them to cash equivalent – that allows setting of an explicit liquidity risk tolerance levels. The new liquidity measures developed - namely systemic and idiosyncratic illiquidity – do indicate ensuing elevated levels of market volatility and possible market failure. The algorithm utilizes Market Microstructure approach and assesses Marginal Supply-Demand Curves through effective bid-ask spreads. It is applied in LARC software, which demonstrates good predictive power when studying the Euro-Denominated Bond Market in the period January 2007 – November 2009. Thus, the model can also serve as an early-warning system. The case studies prove that elevated levels of liquidity risk are manifest before the realization of periods of high market volatility and increased perception of credit risk by the market. Its findings confirm that realization of liquidity risk precedes realization of market and credit risk, which vouches for the soundness of the algorithm when assessing issuers’ liquidity profile. We posit that the LARC model – using both its early-warning and optimization capabilities – can be applied to address a number of real-world issues faced by institutional investors and other financial institutions. The selection of a liquid investment universe is one application; another is liquidity optimization that complements traditional Markowitz optimization and/or VaR analysis. Our framework is flexible and modular enough that it can be integrated with or interwoven into existing credit risk systems, depending on the robustness desired and the policy of the institution.

POSTER: 9

Forecasting Euro Area GDP Growth and Inflation with a Bayesian Vector Autoregression

Tim Oliver Berg1, Steffen Roman Henzel2

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Forecasting models with large cross-sections are often subject to overparameterization leading to unstable parameter estimates and inaccurate forecasts. While factor models have been used in the past to achieve dimension reduction, recent articles suggest that a large Bayesian vector autoregression (BVAR) with sufficient prior information can forecast better. In this paper we consider different variants of the BVAR to forecast euro area real GDP growth and HICP inflation using a dataset comprising 44 variables. We find that the relative performance of the BVAR variants depends on various factors, providing no clear evidence in favor of a particular variant. While a large BVAR produces the best point forecasts for inflation, the performance is poor when the entire density of the forecasts is evaluated. In contrast, point forecasts for GDP growth coming from BVAR averaging and Bayesian factor augmented VARs show little to no improvement over a random walk but generate good density forecasts. We show that the outcome also depends on the state of the business cycle.
POSTER: 10

**What drives the Volatility Risk Premium?**

**Elena Andreou**<sup>1</sup>, **Eric Ghysels**<sup>2</sup>

<sup>1</sup>University of Cyprus, Cyprus; <sup>2</sup>University of North Carolina at Chapel Hill, USA; elena.andreou@ucy.ac.cy

The volatility risk premium, which is the difference between the objective and risk-neutral expected future volatility, is used as an indicator of market distress in empirical finance and macro models and it is also used as a predictor for future stock returns. In most models this variance risk premium is assumed to represent exogenous risk factors or state variables in the economy. Using a new approach to uncover risk factors extracted from a large panel of financial assets, we find that the volatility risk premium is mainly driven by our proposed two new factors that span certain classes of financial assets. Studying horizons up to six months, we find that the volatility risk premium and expected returns are driven by these two new risk factors. The traditional factors, including those suggested by various consumption-based asset pricing models, are found to be insignificant in comparison to the factors we find to be the key determinants.

POSTER: 11

**Fiscal Foresight, Limited Information and the Effects of Government Spending Shocks**

**Emanuel Maximilian Gasteiger**<sup>1</sup>, **Matteo Fragetta**<sup>2</sup>

<sup>1</sup>Instituto Universitário de Lisboa (ISCTE - IUL); <sup>2</sup>University of Salerno; emanuel.gasteiger@iscte.pt

We quantify the impact of government spending shocks in the US. Thereby, we control for fiscal foresight, a specific limited information problem (LIP) by utilizing the narrative approach. Moreover, we surmount the generic LIP inherent in vector autoregressions (VARs) by a factor-augmented VAR (FAVAR) approach. We find that a positive deficit-financed defense shock raises output by more than in a VAR (e.g. 2.61 vs. 2.04 for peak multipliers). Furthermore, our evidence suggests that consumption is crowded in. These results are robust to variants of controlling for fiscal foresight and reveal the crucial role of the LIP in fiscal VARs.

POSTER: 12

**BMA and Principal Components forecasts in data rich environments**

**Rachida Ouyssse**

The University of New South Wales, Australia; rouysse@unsw.edu.au

We study the out-of-sample forecast performance of two alternative methods for dealing with dimensionality: Bayesian model Averaging (BMA) and principal components regression (PCR). We conduct a different out-of-sample investigation in which the predictors are chosen jointly for both output and inflation using Bayesian variable selection in each out-of-sample recursion using information available at the time of the forecast. This framework implies stochastic nonparametric time-varying reduced form which offers flexibility in capturing structural changes and instabilities of unknown forms. While the competing forecasts are highly correlated, PCR performed marginally better than BMA in terms of mean-squared forecast error. However, this marginal edge in the average global out-of-sample performance hides important changes in the local forecasting power. An analysis of the Theil index indicates that the loss of performance of PCR is due mainly to its exuberant biases in matching the mean of the two series especially the inflation series. BMA forecasts series matches the first and second moments of the GDP and inflation series very well with practically zero biases and very low volatility. The fluctuation statistic that measures the relative local performance shows that BMA performed consistently better than PCR and the naive random walk benchmark over the period prior to 1985. Thereafter, the performance of both BMA and PCR was relatively modest compared to the naive benchmark.
S07: Session 7

**S07: Session 7**

*Time: Friday, 03/May/2013: 3:00pm - 4:30pm · Location: HS 2*

**Session Chair:** Christian Brownlees, UPF

### S07: 1

**NETS: Network Estimation for Time Series**

Matteo Barigozzi\(^1\), Christian Brownlees\(^2\)

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This work proposes novel network analysis techniques for time series. We define the network of a multivariate time series as an undirected graph where nodes denote the components of the process and edges denote nonzero long run partial correlation between two components. Long run partial correlation is a comprehensive measure of cross-sectional conditional dependence for time series capturing contemporaneous as well as lead/lag relations. We then introduce an algorithm called NETS to estimate sparse long run partial correlation networks, a procedure that detects which edges are present in the network from the data. The algorithm is based on a two step LASSO regression of the VAR approximation of the process. The large sample properties of the estimator are analysed and we establish conditions for consistent estimation of the network. The methodology is illustrated with an application to a panel of U.S. bluechips. The risk of monthly equity returns is decomposed in a systematic and an idiosyncratic components and NETS is used to analyse the network structure of the idiosyncratic part. The empirical analysis shows that the idiosyncratic risk network captures a significant portion of the total risk and that it exhibits several of the empirical regularities found in social networks.

### S07: 2

**Flocking and Generalized Factor Analysis**

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We propose a new modeling paradigm for large dimensional aggregates of stochastic systems by Generalized Factor Analysis (GFA) models. These models describe the data as the sum of a flocking plus an uncorrelated idiosyncratic component. The flocking component describes a sort of collective orderly motion which admits a much simpler mathematical description than the whole ensemble while the idiosyncratic component describes weakly correlated noise. We first discuss static GFA representations and characterize in a rigorous way the properties of the two components. For wide-sense stationary sequences the character and existence of GFA models is completely clarified. The extraction of the flocking component of a random field is discussed for a simple class of separable random fields.

### S07: 3

**Manifold learning for nonlinear factorization of high-dimensional time series**

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In many fields of applied sciences and economics, collection of time series such as stocks or energy prices are governed by a non-linear dynamical process. These time series are often measured hourly, thus, each day can be viewed as a high-dimensional data point. A fundamental task for understanding the observed data is to generate a a small number of factors that describes the non-linear dynamics that govern the process. In this work we employ a recently introduces manifold learning technique to extract a set of stable independent intrinsic factors from a number of observed datasets that are governed by the same salient modes. The main advantage of the proposed method over the common manifold learning techniques is that while classical manifold learning methods find embedding coordinates from the geometry of the observable manifold, here, the obtained embedding coordinates build an inverse mapping of the observed data into the space of the underlying physical factors that drive the process. The proposed method is demonstrated on electricity price data that was collected from several zones in the New York area. We show that even though the observed output spaces differ by the local spatial influences of the zone, the common global factors that drive the underlying process are extracted. Furthermore, we find that these factors capture the external physical components that drive the electricity price market such as the yearly season and the stability of the stock market.
Bootstrap Joint Prediction Regions

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Many economic and financial applications require the forecast of a random variable of interest over several periods into the future. The sequence of individual forecasts, one period at a time, is called a path-forecast, where the term path refers to the sequence of individual future realizations of the random variable. The problem of constructing a corresponding joint prediction region has been rather neglected in the literature so far: such a region is supposed to contain the entire future path with a prespecified probability. We develop bootstrap methods to construct joint prediction regions. The resulting regions are proven to be asymptotically consistent under a mild high-level assumption. We compare the finite-sample performance of our joint prediction regions to some previous proposals via Monte Carlo simulations. An empirical application to a real data set is also provided.

Bayesian Minimization of Stein Loss in Covariance Matrix Estimation

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This paper proposes a simple conjugate Bayesian regression model adapted to estimating a covariance matrix for a large number of securities. Modeling the return generating process with an unrestricted factor model of covariance, prior beliefs provide a flexible device for consistently imposing structure on the covariance matrix. The framework readily incorporates economically-motivated prior belief specifications as well as nesting a variety of shrinkage covariance matrix estimators, providing a common model with which to interpret these estimators. Within a class of prior beliefs, minimizing its posterior finite-sample square error delivers a fully-automated covariance matrix estimator with beliefs that become diffuse as the sample grows relative to the dimension of the problem. This consistent estimator performs well in Monte Carlo simulations both in terms of mean square error and optimal portfolio diversification exercise.

Semiparametric dynamic factor models for nonstationary time series

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Current approaches for fitting dynamic factor models to nonstationary time series are based on dynamic principal components analysis in the frequency domain. These approaches are fully nonparametric and depend strongly on the chosen bandwidth for smoothing over frequency and time. As an alternative, we propose a semi-parametric approach in which only parts of the model are allowed to be time-varying. More precisely, we consider two specifications: first, the latent factors admit a dynamic representation with time-varying autoregressive coefficients while the loadings are constant over time. Second, the factor model is stationary while the loadings are time-varying.

Estimation of the model parameters is accomplished by application of the EM algorithm and the Kalman filter. The time-varying parameters are modelled locally by polynomials and estimated by maximizing the likelihood locally. We illustrate our approach by simulation results and applications to real data.
P5: Plenary 5

Time: Friday, 03/May/2013: 5:00pm - 6:00pm · Location: HS 2
Session Chair: Bernd Funovits, University of Vienna

P5: 1

Prior Selection for Vector Autoregressions

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Vector autoregressions (VARs) are flexible time series models that can capture complex dynamic interrelationships among macroeconomic variables. However, their dense parameterization leads to unstable inference and inaccurate out-of-sample forecasts, particularly for models with many variables. A solution to this problem is to use informative priors, in order to shrink the richly parameterized unrestricted model towards a parsimonious naïve benchmark, and thus reduce estimation uncertainty. This paper studies the optimal choice of the informativeness of these priors, which we treat as additional parameters, in the spirit of hierarchical modeling. This approach is theoretically grounded, easy to implement, and greatly reduces the number and importance of subjective choices in the setting of the prior. Moreover, it performs very well both in terms of out-of-sample forecasting—as well as factor models—and accuracy in the estimation of impulse response functions.
Dynamic Factor Models with Infinite-Dimensional Factor Space: Representation and Estimation

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We argue that the usual assumption in Large-Dimensional Dynamic Factor Models, that the factor space is finite-dimensional, is restrictive and potentially harmful. In the infinite-dimensional case, under the assumption of rational spectral density of the common components, we construct a finite autoregressive representation for the common components. We also obtain an estimator, based on the frequency domain approach, and prove consistency with rates.

Monte Carlo experiments show that our estimator outperform the standard estimator bases on PC's even in the case of a finite-dimensional factor space. The presentation is based on papers by Mario Forni, Marc Hallin, Marco Lippi and Paolo Zaffaroni.
P7: Plenary 7

Time: Saturday, 04/May/2013: 10:30am - 11:30am · Location: HS 2
Session Chair: Manfred Deistler, Vienna University of Technology and IHS

P7: 1

Dynamic Sparsity Modelling

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In the context of sparsity modelling in multivariate time series, the recently introduced concept of dynamic latent thresholding has been demonstrably valuable in a number of studies. Several recent applications include studies in finance and econometrics where the new modelling approach induces improved forecasts, resulting decisions and model interpretations, while the ideas are relevant in other areas. I will describe the general idea of latent thresholding as an approach to dynamic sparsity modelling in multivariate time series. In a selection of model contexts-- dynamic factor models, time-varying vector autoregressions, multivariate volatility models—applications will highlight the practical interest in dynamic latent thresholding: its ability to induce data-driven, time-adaptive parsimony in multivariate dynamic model reduce estimation and prediction uncertainties, improve predictive model fit and out-of-sample predictions.