PNRR - Missione 4, Componente 2, Investimento 1.1 - Bando Prin 2022 - Decreto Direttoriale n. 104 del 02-02-2022 Progetto ***Methodological and computational issues in large-scale time series models for economics and finance***

Intermediate Workshop

Project *Methodological and computational issues in large-scale time series models for economics and finance*

Messina 11 September 2024

Room 12, Department of Economics

Organizers: Edoardo Otranto, Fabio Spagnolo

Università degli Studi di Messina
Dipartimento di

protocollo@unime.it
protocollo@pec.unime.it
www.unime.it

P.IVA 00724160833
Cod. Fiscale 80004070837

Program

9:00-10:30 Session 1: Presentations of UNIROMA 1 and UNIROMA2 Units

Massimo Franchi, Iliyan. Georgiev, Paolo Paruolo
Estimation and inference on stochastic trends via functional approximation

Francesco Giancaterini, Alain Hecq, Joann Jasiak, Aryan Manafi Neyazi
Green Bubbles: a Noncausal Approach

Gianluca Cubadda
VAR models with an index structure: A survey with new results

10:30-11:00 Coffee Break

11:00-12:30 Presentations of UNISA and UNIVPM Units

Pietro Coretto, Alfonso Peluso
Community detection in financial networks and the importance of being robust

Richard Gerlach, Antonio Naimoli, **Giuseppe Storti**
Using quantile time series and historical simulation to forecast financial risk multiple steps ahead

Riccardo Lucchetti, **Marco Tedeschi**
Honey, we shrunk the IRFs! Using 1-norm regularisation to improve inference in structural VAR models

12:30-13:45 Presentations of UNIME Unit

Alessandra Canepa
Modelling Inflation Persistence: The Importance of the Uncertainty Channel

Luc Bauwens, **Edoardo Otranto**
Realized Covariance Models with Time-varying Parameters and Spillover Effects

Martin Sola, **Fabio Spagnolo,** Nicola Spagnolo
Do Periods of Extreme Asset Price Volatility Signal the Beginning of a Recession?

ABSTRACTS

Massimo Franchi, Iliyan. Georgiev, Paolo Paruolo

Estimation and inference on stochastic trends via functional approximation

This paper proposes a novel canonical correlation analysis for semiparameteric inference in the presence of I(1)/I(0) processes, both on the number of common trends and on the loading matrix. The approach displays reliable performance in small, medium and large-dimensional systems. Inferential tools include: test sequences as well as consistent estimators on the number of common trends, superconsistent and mixed-Gaussian estimators of the loading matrix of common trends and of their dual (the cointegrating matrix), Wald tests thereof and misspecification tests for checking model assumptions. The limit distribution of the estimator of the loading matrix is efficient, and coincides with the one of the Maximum Likelihood estimator in the particular case of Vector Autoregressions.

Francesco Giancaterini, Alain Hecq, Joann Jasiak, Aryan Manafi Neyazi

Green Bubbles: a Noncausal Approach

The phenomenon of the "green bubble" has drawn attention in the field of renewable energy investment, raising concerns about potential economic and environmental implications. This paper presents an investigation into mixed causal and noncausal models applied to the Renixx green bubble indicator, offering an innovative approach to analyzing such phenomena. Departing from traditional definitions of bubbles, we adopt a perspective in which the Renixx price index is viewed as following a strictly stationary process, with the bubble considered an inherent component of its dynamics. Through the exploration of causal-noncausal autoregressive processes, we aim to uncover insights into the dynamics of green bubbles and their broader implications. Our findings contribute to the understanding of financial and environmental sustainability in the context of investments in renewable energy.

Gianluca Cubadda

VAR models with an index structure: A survey with new results

The main aim of this paper is to review recent advances in the multivariate autoregressive index model [MAI], originally proposed by Reinsel (1983), and their applications to economic and financial time series. The MAI has recently gained momentum because it can be seen as a link between two popular but distinct multivariate time series approaches: vector autoregressive modeling [VAR] and the dynamic factor model [DFM]. Indeed, on the one hand, the MAI is a VAR model with a peculiar reduced-rank structure; on the other hand, it allows for identification of common components and common shocks in a similar way as the DFM. The focus is on recent developments of the MAI, which include extending the original model with individual autoregressive structures, stochastic volatility, time-varying parameters, high-dimensionality, and cointegration. Furthermore, some novel insights and results are also provided.

Pietro Coretto, Alfonso Peluso

Community detection in financial networks and the importance of being robust

Stock market networks refer to the interconnected relationships between stocks or financial instruments. By studying stock market networks, researchers can gain insights into complex market dynamics and the impact of specific stocks on the overall market. The identification of stock networks has evolved significantly over the past few decades, primarily driven by the work of physicists who have applied complex systems analysis to financial markets. This study advances the methodology for analyzing stock networks in two directions. First, we introduce robust methods in each step of the analysis. Traditional approaches to building these networks are based on empirical correlation matrices and OLS-based methods to filter out variations driven by the market trend. We replace the classical methods with robust methods capable of taming the well-known influence of exceptional variations in stock returns often occurring during shocks and sharp transitions between dynamic regimes. Additionally, we propose network fusion algorithms that allow embedding the information from different sources (returns and their volatility, traded volumes, etc.) in a single network. We show empirical evidence that fused networks reconstructed using robust methodologies lead to the discovery of more compact clusters that are more stable and sector-accurate. This combined approach holds promise for future applications in financial network analysis.

Richard Gerlach, Antonio Naimoli, Giuseppe Storti

Using quantile time series and historical simulation to forecast financial risk multiple steps ahead

A method for quantile-based, semi-parametric historical simulation estimators of multiple step ahead Value-at-Risk (VaR) and Expected Shortfall (ES) models is extended and developed. The method is based on employing the quantile loss function, analogous to how the quasi-likelihood is employed by standard historical simulation methods. The estimated quantile series is used to scale the returns data, then re-sampling methods are employed to estimate the forecast distribution one step and multi-steps ahead, allowing tail risk forecasting. The method is extended to allow a measurement equation, thus incorporating realized measures and including Realized GARCH and Realized CaViaR type models in the class of models it pertains to. The proposed method implicitly assumes, and is applicable to, any data or model where the relationship between VaR and ES in the conditional return distribution does not change over time; this includes most modern financial time series models. The finite sample properties of this method, and its comparison with existing historical simulation methods, are assessed via a simulation study. A forecasting study, applied to 3 indices and 3 assets, assesses the relative accuracy of the one-day-ahead and ten-day-ahead accuracy of 1% and 2.5% VaR and ES forecasting results for the proposed model class, compared to several competitors.

Riccardo Lucchetti, Marco Tedeschi

Honey, we shrunk the IRFs! Using 1-norm regularisation to improve inference in structural VAR models

In the Structural VAR framework, the curse of dimensionality causes the confidence bands around IRFs to be very large, especially in small samples. This issue is particularly evident in macroeconomic applications, since the data are typically observed at low frequencies and their timespan of data is often limited. In this paper, we investigate the effects of $\ell 1$ shrinkage in both VAR coefficients and covariance matrix with a view to ascertaining whether shrinkage could improve estimation accuracy. Via two simulation exercises on two well-known SVAR applications, we find evidence that shrinkage can improve estimation accuracy for the IRFs, especially when the sample is small, which is often the case in practice.

Alessandra Canepa

Modelling Inflation Persistence: The Importance of the Uncertainty Channel

In this article, we employ a time-varying GARCH-type specification to model inflation and investigate the behaviour of its persistence. Specifically, by modelling the inflation series as AR(1)-APARCH(1,1)-in-mean-level process with breaks, we show that persistence is transmitted from the conditional variance to the conditional mean. Accordingly, we propose a new measure of time-varying persistence, which not only distinguishes between changes in the dynamics of inflation and its volatility but also allows for feedback between the two variables. Analysing the inflation series for a number of countries, we find evidence that inflation uncertainty plays an important role in shaping expectations, and a higher level of uncertainty increases inflation persistence. We also consider a number of unit root tests and present the results of a Monte Carlo experiment to investigate the size and power properties of these tests in the presence of breaks in the mean and the variance equation of an AR(1)-APARCH(1,1)-in-mean-level data generating process. The Monte Carlo experiment reveals that if the model is misspecified, then commonly used unit root tests will misclassify inflation as a nonstationary, rather than a stationary process.

Luc Bauwens, Edoardo Otranto

Realized Covariance Models with Time-varying Parameters and Spillover Effects

A realized covariance model specifies a dynamic process for a conditional covariance matrix of daily asset returns as a function of past realized variances and covariances. We propose parsimonious parameterizations enabling a spillover effect in the conditional variance equations, and a specific nonlinear, time-varying, effect of the lagged realized covariance between each asset pair on the corresponding conditional covariance. We introduce these parameterizations in BEKK, DCC and HAR type scalar models. In an application to the components of the Dow Jones index, we find that the extended models improve the fit and the out-of-sample forecast performances of their less flexible scalar versions, in particular for short forecast horizons.

Martin Sola, Fabio Spagnolo, Nicola Spagnolo

Do Periods of Extreme Asset Price Volatility Signal the Beginning of a Recession?

This paper investigates the interrelationship between financial markets and real economic activity. We propose a procedure for analysing links between stock market volatility and output growth based on a bivariate Markov switching model. The method provides a convenient way of analysing the predictive content of different series' first and second moments. We examine and discuss an empirical application of this procedure to the U.S.