Waseda Academic Events

Organizer: Masanobu Taniguchi (Waseda University)

Date: February 6-7, 2023

Venue: Room 62-1-B, Nishi-Waseda Campus, Waseda Univ.

(Access map: https://www.waseda.jp/fsci/en/access/)

Supported by:

JSPS KAKENHI Kiban (S) Grand-in-Aid No. 18H05290

(M. Taniguchi)

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Program (*speaker)

February 6 (Mon.)

Venue: Room 62-1-B, Nishi-Waseda Campus, Waseda Univ.

Academic Discussion (14:00-17:00): chaired by M.Taniguchi

(i) **Causality, prediction and interpolation**

(ii) **High dimensional problem and factor models**

(iii) **Time series ANOVA problem**

(iv) **Continuous time stochastic processes and COGARCH**

(v) **Non-asymptotic theory for statistics and robustness**

(vi) **Threshold models and their inference & applications**

February 7(Tue.) Waseda Mini-Workshop

Venue: Room 62-1-B, Nishi-Waseda Campus, Waseda Univ.

Session I (10:00-11:50): chaired by H.Ogata

(1) 10:00–10:50: Greta Goracci* (Univ. Bolzano); Davide Ferrari; Simone Giannerini; Francesco Ravazzolo
Robust estimation for threshold autoregressive moving-average models

(2) 11:00–11:50: Francesco Angelini; Massimiliano Castellani; Simone Giannerini* (Univ. Bologna); Greta Goracci
Testing for Threshold Effects in Presence of Volatility and Measurement Error: The Case of Italian Strikes

11:50–13:00: Lunch Time

Session II (13:00-14:40): chaired by Y. Nishiyama

(3) 13:00–13:50: Matteo Barigozzi* (Univ. Bologna)
Factor Network Autoregressions

(4) 13:50–14:40: Illia Negri* (Univ. Bergamo)
Change point problems for linear time series: an approach based on the Z process

14:40 – 15:00: Coffee Break

Session III (15:00-16:40): chaired by Y. Liu

(5) 15:00–15:50 Yannick, Baraud* (Univ. Luxemberg)
Robust Estimation in Exponential Families

(6) 15:50–16:40 Tommaso, Proietti* (Univ. Rome); Alessandro Giovannelli (Univ. L'Aquila)
The predictability of sea surface temperatures in El Nino regions

February 8 (Wed.)

Academic & Historical Excursion in Tokyo & Neighborhood

Abstracts

Title: Robust estimation for threshold autoregressive moving-average models

Authors: Greta Goracci*; Davide Ferrari; Simone Giannerini; Francesco Ravazzolo

Abstract: Threshold autoregressive moving-average (TARMA) models are popular in time series analysis due to their ability to parsimoniously describe several complex dynamical features. However, neither theory nor estimation methods are currently available when the data present heavy tails or anomalous observations, which is often the case in applications. In this paper, we provide the first theoretical framework for robust M-estimation for TARMA models and also study its practical relevance. Under mild conditions, we show that the robust estimator for the threshold parameter is super-consistent, while the estimators for autoregressive and moving-average parameters are strongly consistent and asymptotically normal. The Monte Carlo study shows that the M-estimator is superior, in terms of both bias and variance, to the least squares estimator, which can be heavily affected by outliers. The findings suggest that robust M-estimation should be generally preferred to the least squares method. Finally, we apply our methodology to a set of commodity price time series; the robust TARMA fit presents smaller standard errors and leads to superior forecasting accuracy compared to the least squares fit. The results support the hypothesis of a two-regime, asymmetric nonlinearity around zero, characterised by slow expansions and fast contractions.

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Title: Testing for Threshold Effects in Presence of Volatility and Measurement Error: The Case of Italian Strikes

Authors: Francesco Angelini; Massimiliano Castellani; Simone Giannerini*; Greta Goracci

Abstract: We address the issue of testing for a threshold ARMA effect in presence of conditional heteroscedasticity. We show that tests that do not account for the presence of volatility fail to achieve the correct size even for moderate to large sample sizes. We propose a supremum Lagrange Multiplier test statistic where the null hypothesis specifies a linear ARMA-GARCH model against the alternative of a TARMA-GARCH model. We derive the asymptotic theory for the test and use it for the analysis of the macroeconomics series of Italian strikes. We show that the TARMA-GARCH specification is consistent with the relevant macroeconomic theory while capturing the main features of the Italian strikes dynamics, such as asymmetric cycles and regime switching. Moreover, we show that the TARMA specification naturally accounts for the ubiquitous presence of measurement error that affects macroeconomic data.

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Title: Factor Network Autoregressions

Author: Matteo Barigozzi*

Abstract: We propose a factor network autoregressive (FNAR) model for time series with complex network structures. The coefficients of the model reflect many different types of connections between economic agents ("multilayer network"), which are summarized into a smaller number of network matrices ("network factors") through a novel tensor-based principal component approach. We provide consistency results for the estimation of the factors and the coefficients of the FNAR. Our approach combines two different dimension-reduction techniques and can be applied to ultra-high dimensional datasets. In an empirical application, we use the FNAR to investigate the cross-country interdependence of GDP growth rates based on a variety of international trade and financial linkages. The model provides a rich characterization of macroeconomic network effects and exhibits good forecast performance compared to popular dimension-reduction methods.

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Title: Change point problems for linear time series: an approach based on the Z process

Author: Ilia Negri*

Abstract: The Z-process method was introduced as a general unified approach based on partial estimation functions to construct a statistical test in change point problems for ergodic models but also for some models where the Fisher information matrix is random. In this talk, we consider the problem of testing for

parameter changes in linear time series models based on this Z-process method. The methods can test for change in any of the parameters in the model simultaneously. We study the asymptotic distribution of the test statistics under the null hypothesis and under a very general alternative. We present a simulated experiment where under different scenarios we evaluate the behavior of the proposed test statistics. Some applications to real data sets are also presented. Moreover, a change-point estimator based on the test statistics is also defined and its properties explored.

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Title: Robust Estimation in Exponential Families

Author: Yannick, Baraud*

Abstract: We observe a finite number of pairs of random variables that are presumed to be i.i.d. and we consider the problem of estimating the conditional distribution of the second coordinate given the first. We model this conditional distribution as an element of a given single-parameter exponential family for which the value of the parameter is an unknown function of the first coordinate of the pair. We provide an estimator of the conditional distribution based on our observations and analyse its performance not only when the statistical model is exact, as commonly done in statistics, but also when it is possibly misspecified (the pairs are independent but not exactly i.i.d., the true conditional distribution does not belong to the chosen exponential family, etc). We establish non-asymptotic

risk bounds and show that our estimator is robust to a possible departure from the hypotheses we started from. Finally we provide an algorithm to compute the estimator in low or medium dimensions and compare its performance to that of the celebrated maximum likelihood estimator.

This is a joint work with Juntong Chen.

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Title: The predictability of sea surface temperatures in El Nino regions

Author: Tommaso, Proietti*; Alessandro Giovannelli

Abstract: The El Nino Southern Oscillation induces the alternation of persistent warming and cooling of sea surface temperatures along the equator in the east-central Pacific. We investigate the predictability and the persistence of the El Nino cycle by considering sea surface temperature anomalies averaged over four rectangular areas that subdivide the equatorial Pacific (Nino 1, 2, 3-4, and 4 regions), using a large dimensional system of time series dealing with sea level pressure, trade winds anomalies and warm water volume. Our methodology is based on a regularized multivariate Durbin Levinson-type algorithm for estimating the cross-covariance and spectral density matrix of the series. A structural analysis is performed for estimating the impulse response function to typical El Nino and La Nina shocks.

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