量化风险管理及相关课题
青年学者研讨会

会议手册

主办单位

复旦大学大数据学院

上海数学中心

2021年10月23-24日 中国 · 上海

目录

会议简介

量化风险管理主要关注风险数据的建模分析以及推断其对未来的潜在影响。可靠的预测分析有助于更明智的管理决策，将为经济金融机构带来巨大的益处。近年来，风险数据越来越容易获取，且数据质量越来越高，更多的定量方法与技术有待科研人员们去探索与研究，从而更深入地了解潜在风险、估计风险、防范风险，这往往要求结合统计、金融、计量、精算、保险等相关领域中的方法和模型，实现风险建模与分析上的创新。

由复旦大学与上海数学中心联合主办的“量化风险管理及相关课题青年学者研讨会”将于 2021 年 10 月 23-24 日在上海举行。本次研讨会旨在为包含极值理论、金融计量、精算保险等量化风险管理相关领域的国际国内青年学者提供学术交流与讨论的平台，分享最新的学术成果与科研进展，共同探讨量化风险管理和相关研究领域的未来发展趋势。

本次会议由复旦大学大数据学院侯燕曦副教授和上海数学中心赵宇微青年研究员联合策划组织，诚邀国内外著名高校青年学者共同探讨量化风险管理相关研究领域的新思想、新方法、新成果！

会议人员

报告人：（按姓氏顺序排列）

蔡娟娟	阿姆斯特丹自由大学
陈　律	华东师范大学
高光远	中国人民大学
何　易	阿姆斯特丹大学
黄　斐	新南威尔士大学
冷　旋	厦门大学
李津竹	南开大学
毛甜甜	中国科学技术大学
史彦琳	麦考瑞大学
王天栋	德州农工大学
张荣茂	浙江大学
张　霆	佐治亚大学

组织人：

侯燕曦	复旦大学
赵宇微	上海数学中心

会议事项

1. 会议时间

10 月 22 日报到，10 月 23-24 日会议报告，10 月 25 日离会

2. 会议费用

会议无注册费，食宿行费用自理

3. 会议方式

海外报告人线上参会，国内参会人线下参会

4. 会议地点

留白空间（五角场店）

地址：杨浦区伟成路 70 号弘源创新大厦 1 号楼 805 室

5. 酒店住宿

会议酒店：上海五角场 Pagoda 君亭设计酒店（地址：上海杨浦政学路 77 号）

协议价格：单间每晚 500 元（含早）

6. 酒店信息

上海五角场 Pagoda 君亭设计酒店坐落在上海五角场商圈的创智天地内，周边商业大厦鳞次栉比，著名高等学府林立，各种娱乐设施齐全。

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地址：上海市杨浦区政学路 77 号
电话：021-60139666

7. 交通信息

□ 上海浦东国际机场 → 五角场 Pagoda 君亭设计酒店
地铁：地铁 2 号线（徐泾东方向）南京东路 站内换乘 → 地铁 10 号线（基隆路方向） 江湾体育场 10 号口（步行至酒店 9 分钟路程）
预计用时：1 小时 32 分钟，7 元
出租车：预计时间 50 分钟，约 140 元

□ 上海虹桥站 → 五角场 Pagoda 君亭设计酒店
地铁：地铁 10 号线（基隆路方向） 江湾体育场 10 号口（步行至酒店 9 分钟路程）
预计用时：1 小时 6 分钟，6 元
出租车：预计时间 40 分钟，约 90 元

日程

日期	时间	事项	报告题目
10 月 22 日	17:00-20:00	签到	
10 月 23 日 上午	08:30-09:00	签到 （报到并领取会议材料）	
	09:00-09:15	开幕仪式/合影	
	09:15-10:05	报告一第 1 场 报告人：张霆（佐治亚大学）	High Quantile Regression for Tail Dependent Time Series
	10:05-10:20	茶歇	
	10:20-11:10	报告一第 2 场 报告人：王天栋（德州农工大学）	Asymptotic Dependence of In- and Out-Degree in a Preferential Attachment Model with Reciprocity
	11:10-12:00	报告一第 3 场 报告人：李津竹（南开大学）	Asymptotic Results on Marginal Expected Shortfalls under Extensive Dependence Structures
	12:15-13:45	午餐及午休	
10 月 23 日 下午	13:45-14:35	报告一第 4 场 报告人：张荣茂（浙江大学）	Cointegration Rank Estimation for High-Dimensional Time Series with Breaks
	14:35-15:20	茶歇与座谈	
	15:20-16:10	报告一第 5 场 报告人：高光远（中国人民大学）	Gradient boosting mixture regression models
	16:10-17:00	报告一第 6 场 报告人：毛甜甜 （中国科学技术大学）	Distributionally robust risk optimization under distorted Expectation
	17:30	晚餐	
10 月 24 日 上午	09:20-10:10	报告一第 1 场 报告人：黄斐（新南威尔士大学）	Cause-of-Death Mortality Forecasting using Adaptive Penalized Tensor Decomposition
	10:10-10:25	茶歇	
	10:25-11:15	报告一第 2 场 报告人：冷旋（厦门大学）	Multi-dimensional Latent Group Structures with Heterogeneous Distributions

	11:15-12:05	报告一第 3 场 报告人：陈律（华东师范大学）	保险公司与再保险公司的主从博弈策略研究
	12:15-13:45	午餐及午休	
10 月 24 日 下午	13:45-14:35	报告一第 4 场 报告人：史彦琳（麦考瑞大学）	Age-coherent mortality modeling and forecasting using a constrained sparse vector-autoregressive mode
	14:35-15:20	茶歇与座谈	
	15:20-16:10	报告一第 5 场 报告人：何易（阿姆斯特丹大学）	Risk Analysis via Generalized Pareto Distributions
	16:10-17:00	报告一第 6 场 报告人：蔡娟娟 （阿姆斯特丹自由大学）	Gradient boosting for extreme quantile regression
	17:30	晚餐	
10 月 25 日	全天	离会	

10 月 23 日报告摘要

报告第 1 场

10 月 23 日上午 09:15--10:05

张霆　佐治亚大学

题目：High Quantile Regression for Tail Dependent Time Series

摘要：Quantile regression serves as a popular and powerful approach for studying the effect of regressors on quantiles of a response distribution. However, existing results on quantile regression were mainly developed when the quantile level is fixed, and the data are often assumed to be independent. Motivated by recent applications, we consider the situation where (i) the quantile level is not fixed and can grow with the sample size to capture the tail phenomena; and (ii) the data are no longer independent but collected as a time series that can exhibit serial dependence in both tail and non-tail regions. To study the asymptotic theory for high quantile regression estimators in the time series setting, we introduce a previously undescribed tail adversarial stability condition, and show that it leads to an interpretable and convenient framework for obtaining limit theorems for time series that exhibit serial dependence in the tail region but are not necessarily strong mixing. Numerical experiments are provided to illustrate the effect of tail dependence on high quantile regression estimators, where simply ignoring the tail dependence may lead to misleading p-values.

报告第 2 场
10 月 23 日上午 10:20--11:10

王天栋 德州农工大学
题目：Asymptotic Dependence of In- and Out-Degree in a Preferential Attachment Model with Reciprocity
摘要：Reciprocity characterizes the information exchange between users in a network, and some empirical studies have revealed that social networks have a high proportion of reciprocal edges. Classical directed preferential attachment (PA) models, though generating scale-free networks, may give networks with low reciprocity. This points out one potential problem of fitting a classical PA model to a given network dataset with high reciprocity, and indicates alternative models need to be considered. We give one possible modification of the classical PA model by including another parameter, which controls the probability of adding a reciprocated edge at each step. Asymptotic analyses suggest that large in- and out-degrees become fully dependent in this modified model, as a result of the additional reciprocated edges.

报告第 3 场
10 月 23 日上午 11:10-12:00

李津竹　南开大学
题目：Asymptotic Results on Marginal Expected Shortfalls under Extensive Dependence Structures
摘要：In this paper, we study the asymptotic behavior of three types of Marginal Expected Shortfalls with different reference indices of the overall risk. Our results for the asymptotic independence case are obtained under quite general frameworks, in which no specific distribution class of each individual risk is supposed. For the asymptotic dependence case, we conduct the study under two widely applied assumptions, which imply that the individual risks possess the Fréchet and Gumbel tails, respectively. We also give a comprehensive and deep analysis on the accuracy of our asymptotic results in various scenarios when there are two individual risks in the whole system.

报告第 4 场
10 月 23 日下午 13:45--14:35

张荣茂　浙江大学
题目：Cointegration Rank Estimation for High-Dimensional Time Series with Breaks
摘要：An intuitive and simple-to-use procedure for estimating the cointegration rank of a high-dimensional time series system with possible breaks is proposed

in this paper. Based on a similar idea to principal component analysis, the cointegration rank can be estimated by the number of the eigenvalues of a certain non-negative definite matrix. There are several advantages to the new method: (a) the dimension of the cointegrated time series is allowed to vary with the sample size; (b) it is model-free; and (c) it is simple to use and robust against possible breaks in trend. The cointegration rank can be estimated without the need for a priori testing and estimating of the break points. Asymptotic properties of the proposed methods are investigated when the dimension of the time series increases with the sample size, which offers a new alternative to deal with high-dimensional time series. Illustrations of simulations are also reported.

报告第 5 场
10 月 23 日下午 15:20—16:10

高光远　中国人民大学
题目：Gradient boosting mixture regression models
摘要：The Expectation-Maximization (EM) algorithm is often used to estimate mixture regression models. In this paper, we propose a gradient boosting algorithm for mixture regression models, which combines the EM algorithm and functional gradient decent techniques. The proposed algorithm fully explores the predictive power of covariates and performs variable selection during model fitting. We illustrate those advantages in two simulated examples: a mixture Gaussian model and a zero-inflated Poisson model.

报告第 6 场
10 月 23 日下午 16:10—17:00

毛甜甜　中国科学技术大学
题目：Distributionally robust risk optimization under distorted Expectation
摘要：In this talk, we propose to address a decision maker's risk attitude in Distributionally robust optimization (DRO) by following an alternative scheme known as "dual expected utility". We distinguish DRO based on distorted expectations by terming it "Distributionally Robust Risk Optimization'" (DRRO), and show that DRRO can be equally, if not more, tractable to solve than DRO based on utility functionals. Our tractability results hold for any distortion function, and hence our scheme provides more flexibility to capture more realistic forms of risk attitudes. We characterize the worst-case distributions and discuss their implications.

10 月 24 日报告摘要

报告第 1 场
10 月 24 日上午 09:20—10:10

黄斐　新南威尔士大学
题目：Cause-of-Death Mortality Forecasting using Adaptive Penalized Tensor Decomposition
摘要：Cause-of-death mortality modeling and forecasting is an important topic in demography and actuarial science as it can provide valuable insights into the risks and factors determining future mortality rates. This paper proposes a novel predictive model for cause-of-death mortality forecasting, called adaptive penalised tensor decomposition (APTD). The new method jointly models the three dimensions (cause, age, and year) of the dataset together and provides superior out-of-sample forecasting performance compared to existing models. In particular, by using the adaptive penalty matrices, the new method overcomes the heavy computational burden caused by the selection of tuning parameters when multiple factors are involved in the model proposed by Madrid-Padilla and Scott (2017). Three different approaches (ARIMA, linear extrapolation and GAM) are considered to extrapolate the estimated year factors for forecasting purposes. The US cause-of-death mortality data and various existing models are employed for evaluation and comparison purposes.

报告第 2 场
10 月 24 日上午 10:25—11:15

冷旋　厦门大学
题目：Multi-dimensional Latent Group Structures with Heterogeneous Distributions
摘要：This paper aims to identify the multi-dimensional latent grouped heterogeneity of distributional effects. We consider a panel quantile regression model with additive cross-section and time fixed effects. The cross-section effects and quantile slope coefficients are both characterized by grouped patterns of heterogeneity, but each unit can belong to different groups for cross-section effects and slopes. We propose a composite-quantile approach to jointly estimate multi-dimensional group memberships, slope coefficients, and fixed effects. We show that using multiple quantiles improves clustering accuracy if memberships are quantile-invariant. We apply the methods to examine the relationship between managerial incentives and risk-taking behavior.

报告第 3 场
10 月 24 日上午 11:15—12:05

陈律　华东师范大学

题目：保险公司与再保险公司的主从博弈策略研究

摘要：We study optimal reinsurance in a continuous-time framework, in which an insurer and a reinsurer are two players of a stochastic Stackelberg differential game, i.e., a stochastic leader-follower differential game. Both the insurer and the reinsurer aim to maximize their respective mean-variance cost functionals. To overcome the time-inconsistency issue in the game, we formulate the optimization problem of each player as an embedded game and solve it via a corresponding extended Hamilton-Jacobi-Bellman equation. It is found that the Stackelberg equilibrium can be achieved by the pair of a variance reinsurance premium principle and a proportional reinsurance treaty, or that of an expected value reinsurance premium principle and an excess-of-loss reinsurance treaty. The former optimal reinsurance policy is determined by a unique, model-free Stackelberg equilibrium; the latter one, though exists, may be non-unique and model-dependent, and depend on the tail behavior of the claim-size distribution to be more specific. Moreover, we consider the optimal structure when multiple reinsurers involved in a reinsurance chain as participants of the game.

报告第 4 场

10 月 24 日下午 13:45—14:35

史彦琳　麦考瑞大学

题目：Age-coherent mortality modeling and forecasting using a constrained sparse vector-autoregressive mode

摘要：Accurate forecasts and analyses of mortality rates are essential to many practical issues, such as the population projections and the designing of pension schemes. Recent studies have considered a spatial‐temporal autoregressive (STAR) model, in
which the mortality rates of each age depend on its own historical values (temporality) and the neighboring cohort ages (spatiality). Despite the realization of age coherence and improved forecasting accuracy over the famous Lee-Carter (LC) model, the assumption of STAR that only the effects of the same and the neighboring cohorts exist can be too restrictive. In this study, we adopt a data-driven principle, as in a sparse vector autoregressive (SVAR) model, to improve the flexibility of the parametric structure of STAR and develop a constrained SVAR (CSVAR) model. To solve its objective function consisting of non-standard L2 and L1 penalties subject to constraints, we develop a new algorithm and prove the existence of the desirable age-coherence in CSVAR. Using empirical data from the United Kingdom, France, Italy, Spain, and Australia, we show that CSVAR consistently outperforms the LC, SVAR, and STAR models with respect to forecasting accuracy. The estimates and forecasts of the CSVAR model also demonstrate important demographic differences between these five countries.

报告第 5 场

10 月 24 日下午 15:20—16:10

何易　阿姆斯特丹大学

题目：Risk Analysis via Generalized Pareto Distributions

摘要：We compute the value-at-risk of financial losses in the tail by fitting a generalized Pareto distribution to exceedances over a high but not divergent threshold. This paper infers such a model for both independent observations and time series data. We show that the asymptotic variance for the maximum likelihood estimation depends on the choice of threshold unlike the existing study of using a divergent threshold. For interval estimation, we propose a random weighted bootstrap method with critical values computed by the empirical distribution of the absolute differences between the bootstrapped estimators and the maximum likelihood estimator. The finite sample performance of the derived confidence intervals is demonstrated through numerical studies before applying to real data in insurance and finance.

报告第 6 场

10 月 24 日下午 16:10—17:00

蔡娟娟　阿姆斯特丹自由大学

题目：Gradient boosting for extreme quantile regression

摘要：Extreme quantile regression provides estimates of conditional quantiles outside the range of the data. Classical methods such as quantile random forests perform poorly in such cases since data in the tail region are too scarce. Extreme value theory motivates to approximate the conditional distribution above a high threshold by a generalized Pareto distribution with covariate dependent parameters. This model allows for extrapolation beyond the range of observed values and estimation of conditional extreme quantiles. We propose a gradient boosting procedure to estimate a conditional general- ized Pareto distribution by minimizing its deviance. Cross-validation is used for the choice of tuning parameters such as the number of trees and the tree depths. We discuss diagnostic plots such as variable importance and partial dependence plots, which help to interpret the fitted models. In simulation studies we show that our gradient boosting procedure outperforms classical methods from quantile regression and extreme value theory, especially for high-dimensional predictor spaces and complex parameter response surfaces. An application to statistical post-processing of weather forecasts with precipitation data in the Netherlands is proposed.

笔记区

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SCHOOL OF DATA SCIENCE, FUDAN UNIVERSITY
复旦大学大数据学院


上海数学中心
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MATHEMATICAL SCIENCES