The 5th Dongbei Econometrics Workshop

Titles and Abstracts

Session I

Semiparametric Modeling for Dynamic Financial Networks

Zongwu Cai, University of Kansas

Xiyuan Liu, University of Kansas

Abstract: The degree of interdependences among holdings of financial sectors and its varying patterns are key in forming systemic risks within a financial system. In this article, we propose a VAR model of conditional quantiles with functional coefficients to construct a novel class of dynamic network system, of which the interdependences among tail risks such as Value-at-Risk are allowed to vary with a variable of general economy. Methodologically, we develop an easy-to-implement two-stage procedure to estimate functionals in the dynamic network system by the local linear smoothing technique. We establish the consistency and the asymptotic normality of the proposed estimator under time series settings. The simulation studies are conducted to show that our new methods work fairly well. The potential of the proposed estimation procedures is demonstrated by an empirical study of constructing and estimating a new type of dynamic financial network.

Uniform Inference in Linear Panel Data Models with Two-Dimensional Heterogeneity

Xun Lu, Chinese University of Hong Kong

Liangjun Su, Tsinghua University

Abstract: This paper studies uniform inference in a linear panel data model when the slope coefficients may exhibit heterogeneity over both the individual and time dimensions and they can be correlated with the regressors. We propose a generalized fixed effects (GFE) estimation procedure to estimate the model under suitable identification restrictions. To establish the asymptotic properties of the GFE estimators, we invert a number of large dimensional square matrices by approximating them with quasi-Kronecker structured matrices.

We establish the asymptotic normality of our GFE estimators and show that their convergence rates depend on the unknown degree of parameter heterogeneity. To make a uniform inference on the common slope component, we propose a novel triple-bootstrap procedure and a hybrid procedure to estimate the asymptotic variance.

Identification of Regression Models with a Misclassified and Endogenous Binary Regressor

Hiroyuki Kasahara, University of British Columbia

Katsumi Shimotsu, University of Tokyo

Abstract: We study identification in nonparametric regression models with a misclassified and endogenous binary regressor when an instrument is correlated with misclassification error. We show that the regression function is nonparametrically identified if one binary instrument variable and one binary covariate satisfy the following conditions. The instrumental variable corrects endogeneity; the instrumental variable must be correlated with the unobserved true underlying binary variable, must be uncorrelated with the error term in the outcome equation, but is allowed to be correlated with the misclassification error. The covariate corrects misclassification; this variable can be one of the regressors in the outcome equation, must be correlated with the unobserved true underlying binary variable, and must be uncorrelated with the misclassification error. We also propose a mixture-based framework for modeling unobserved heterogeneous treatment effects with a misclassified and endogenous binary regressor and show that treatment effects can be identified if the true treatment effect is related to an observed regressor and another observable variable.

Testing for Time Stochastic Dominance

Kyungho Lee, Seoul National University

Oliver Linton, University of Cambridge

Yoon-Jae Whang, Seoul National University

Abstract: We propose nonparametric tests for the null hypothesis of time stochastic dominance. Time stochastic dominance makes a partial order of different prospects over time based on the net present value criteria for general utility and time discount function classes. For example, time stochastic dominance can be used for ranking investment strategies or environmental policies based on the expected net present value of the future benefits. We consider an integrated test statistic and derive its large sample distribution. We suggest a path-wise bootstrap procedures that allows for time dependence in a panel data structure. In addition to the least favorable case based bootstrap method, we describe two approaches, the contact-set approach and the numerical delta method, for the purpose of enhancing a power of the test. We prove the asymptotic validity of our testing procedures. We investigate the finite sample performance of the tests in simulation studies. As an illustration, we apply the proposed tests to evaluate the welfare improvement of the Thailand's Million Baht Village Fund Program.

Session II

Debiased GMM

Victor Chernozhukov, Massachusetts Institute of Technology

Juan Carlos Escanciano, Universidad Carlos III de Madrid

Hidehiko Ichimura, University of Tokyo

Whitney K. Newey, Massachusetts Institute of Technology

James M. Robins, Harvard University

Abstract: Many economic and causal parameters depend on nonparametric or high dimensional first steps. We give a general construction of locally robust/orthogonal moment functions for GMM, where moment conditions have zero derivative with respect to first steps. We show that orthogonal moment functions can be constructed by adding to identifying moments the nonparametric influence function for the effect of the first step on identifying moments. Orthogonal moments reduce model selection and regularization bias, as is very important in many applications, especially for machine learning first steps.

We give debiased machine learning estimators of functionals of high dimensional conditional quantiles and of dynamic discrete choice parameters with high dimensional state variables. We show that adding to identifying moments the nonparametric influence function provides a

general construction of orthogonal moments, including regularity conditions, and show that the nonparametric influence function is robust to additional unknown functions on which it depends. We give a general approach to estimating the unknown functions in the nonparametric influence function and use it to automatically debias estimators of functionals of high dimensional conditional location learners. We give a variety of new doubly robust moment equations and characterize double robustness. We give general and simple regularity conditions and apply these for asymptotic inference on functionals of high dimensional regression quantiles and dynamic discrete choice parameters with high dimensional state variables.

Self-Normalized KPSS Tests

Jun Yi Peng, Dongbei University of Finance and Economics

Xiaojun Song, Peking University

Abstract: In this paper, we extend the KPSS test, proposed by Kwiatkowski, Phillips, Schmidt, and Shin (1992), to test the null hypothesis that a series is stationary against the alternative that it has a unit root without using a consistent estimate of the long-run variance (LRV). Under persistent autocorrelation, the LRV estimator proposed by Newey and West (1897,1994) and Andrews (1991) may not be reliable and introduces size and power distortions on the KPSS statistic. Also, the practitioner has to choose the kernel truncation lag that is ultimately arbitrary. To improve the performance of the KPSS and make it robust, we propose the use of self-normalizing methods, like range-based self-normalization by Hong, McCabe and Sun (2020), and Fixed-B asymptotic by Kiefer and Vongelsang (2005), and Amsler, Schmidt, and Vogelsang (2009) to control the effect of the LRV. This study's challenge is that under self- normalization, the KPSS test loses its consistency; that is, under the alternative hypothesis, the test does not diverge. To recover the test's consistency, we devise a mechanism similar to the power enhancement mechanism proposed by Fan, Liao, and Yao (2015). Under the null hypothesis, this mechanism is asymptotically negligible. However, under the alternative hypothesis, the mechanism diverges. We show that this mechanism also enhances the power of the self-normalized KPSS statistics.

Testing for Explosive Behavior under Strongly Dependent Errors

Yiu Lim Lui, Dongbei University of Finance and Economics

Peter C.B. Phillips, Yale University, University of Auckland, University of Southampton, Singapore Management University

Jun Yu, Singapore Management University

Abstract: A heteroskedasticity-autocorrelation robust (HAR) test statistic is proposed to test for a unit root against an explosive root in financial or real asset prices when the errors are strongly dependent. Limit theory for the test statistic is developed and extended to heteroskedastic models. The new test has stable size properties unlike conventional test statistics that typically lead to size distortion and inconsistency in the presence of strongly dependent errors, The new procedure can be used to consistently timestamp the origination and termination of an explosive episode under similar conditions of long memory errors. Simulations are conducted to assess the finite sample performance of the proposed test and estimators. An empirical application to the S&P 500 index highlights the usefulness of the proposed procedures in practical work.

Session III

Approximate Maximum Likelihood for Complex Structural Models

Veronika Czellar, EDHEC Business School

David T. Frazier, Monash University

Eric Renault, University of Warwick

Abstract: Indirect Inference (I-I) is a popular technique for estimating complex parametric models whose likelihood function is intractable, however, the statistical efficiency of I-I estimation is questionable. While the efficient method of moments, Gallant and Tauchen (1996), promises efficiency, the price to pay for this efficiency is a loss of parsimony and thereby a potential lack of robustness to model misspecification. This stands in contrast to simpler I-I estimation strategies, which are known to display less sensitivity to model misspecification precisely due to their focus on specific elements of the underlying structural model. In this research, we propose a new simulation-based approach that maintains the parsimony of I-I estimation, which is often critical in empirical applications, but can also deliver estimators that are nearly as efficient as maximum likelihood. This new approach is based on using a constrained approximation to the structural model, which ensures identification and can deliver estimators that are nearly efficient. We demonstrate this approach through several examples, and show that this approach can deliver estimators that are nearly as efficient as maximum likelihood, when feasible, but can be employed in many situations where maximum likelihood is infeasible.

Sieve BLP: A Semi-Nonparametric Model of Demand for Differentiated Products

Ao Wang, University of Warwick

Abstract: This paper develops a semi-nonparametric approach to identify and estimate the demand for differentiated products. Assuming a random coefficients discrete choice logit model (i.e., mixed logit model), the proposed approach non-parametrically identifies and estimates the distribution of random coefficients. Our method minimizes misspecification errors in the distribution of random coefficients that the routinely used parametric approach is subject to. Moreover, it overcomes the practical challenge of dimensionality in the number of products that remains the main hurdle in the non-parametric estimation of demand functions. We propose a sieve estimation procedure (referred to as sieve BLP) that remains simple to implement, literally as a parametric GMM in the finite sample. Our Monte Carlo simulations show its good and robust finite-sample performance under different data generating processes and problem sizes (i.e., number of products).

Quantile-based network recovery from panel data

Yutao Sun, Dongbei University of Finance and Economics

Wendun Wang, Erasmus University

Abstract: We study the estimation of an unknown network from panel data in which the individuals are connected through the network. We consider two scenarios of the network, depending on whether or not the network differs at each quantile level of the data; and our estimand is the corresponding adjacency matrix. For quantile-variant networks, our approach involves a nonlinear quantile regression model in which the entries of the corresponding adjacency matrix enter as parameters; whereas if the network is quantile-invariant, we employ

a composite quantile regression approach that jointly exploits the data at several quantile levels to improve the efficiency of the estimation. We assume the network sparse and employ standard regularization approaches to achieve an efficient estimation. Our estimation procedures are computationally feasible, in the sense that we use derivative-based nonlinear programming algorithms to expedite the optimization involved in regularized quantile regressions. Simulations are used to demonstrate the performance. In addition, we apply our methods to study sovereign credit risks and find interactions of risks that are not explained by geographical factors.

Session IV

Vector copulas

Yanqin Fan, University of Washington

Marc Henry, The Pennsylvania State University

Abstract: This paper introduces vector copulas associated with multivariate distributions with given multivariate marginals, based on the theory of measure transportation, and establishes a vector version of Sklar's theorem. The latter provides a theoretical justification for the use of vector copulas to characterize nonlinear or rank dependence between a finite number of random vectors (robust to within vector dependence), and to construct multivariate distributions with any given non overlapping multivariate marginals. We construct Elliptical and Kendall families of vector copulas, derive their densities, and present algorithms to generate data from them. The use of vector copulas is illustrated with a stylized analysis of international financial contagion.

Macro-Finance Decoupling: Robust Evaluations of Macro Asset Pricing Models

Xu Cheng, University of Pennsylvania

Winston Wei Dou, University of Pennsylvania

Zhipeng Liao, University of California

Abstract: This paper shows that robust inference under weak identification is important to the evaluation of many influential macro asset pricing models, including long-run risk models and (time-varying) rare-disaster risk models. Building on recent developments in the conditional

inference literature, we provide a novel conditional specification test by simulating the critical value conditional on a sufficient statistic. This sufficient statistic can be intuitively interpreted as a measure capturing the macroeconomic information decoupled from the underlying content of asset pricing theories. Macro-finance decoupling is an effective way to improve the power of the specification test when asset pricing theories are difficult to refute because of a severe imbalance in the information content about the key model parameters between macroeconomic moment restrictions and asset pricing cross-equation restrictions. For empirical application, we apply the proposed conditional specification test to evaluate a time-varying rare-disaster risk model and construct data-driven robust model uncertainty sets.

Social Networks with Unobserved Links

Arthur Lewbel, Boston College

Xi Qu, Shanghai Jiao Tong University

Xun Tang, Rice University

Abstract: We point identify and estimate linear social network models without observing any network links. The required data consist of many small networks of individuals, such as classrooms or villages, with individuals that are each only observed once. We apply our estimator to data from Tennessee's Student/Teacher Achievement Ratio (STAR) Project. Without observing the latent network in each classroom, we identify and estimate peer and contextual effects on students' performance in mathematics. We find that peer effects tend to be larger in bigger classes, and that increasing peer effects would significantly improve students' average test scores.

Session V

Testing for Omitted Variables in the Diffusion Matrix of a Multivariate Diffusion Process

Fuchun Li, Payments Canada

Abstract: We develop a consistent test for omitted variables in each component of the diffusion matrix in a multivariate diffusion process, without specifying the functional form of each component in the diffusion matrix. Using theories of degenerate U-statistics, we show

that each of all these test statistics follows an asymptotic standard normal distribution under null hypothesis, while diverging to infinity if omitted variables exist in the component. Monte Carlo simulations show that in finite samples, our test statistics have reasonable size and good power against a variety of alternatives. We obtain new empirical findings by applying our test statistics to the specification analysis of the term structure of interest rates.

Synthetic Control Method and Stationarity: Estimating the Effect of the Inter-Korean Rapprochement on the Housing Price of a Chinese Border City

Jiaxuan Lu, University of Chicago

Abstract: The synthetic control method has become an increasingly more popular econometric model for comparative studies, but many of its properties are still unknown especially when the actual data generating process of the outcome variable has an autoregressive process. In this paper, I demonstrate that the synthetic control method and its variants could still produce unbiased estimators for the treatment effect even if the actual data generating process has a first-order autoregressive structure for the outcome variable. However, the variances of the pointwise synthetic control estimators would be sensitive to the choice of the cutoff time point, and it would be increasing over time after the cutoff time point. Hence, I advise to take the first difference of the outcome variable to remove the unit root before using the synthetic control method when the panels are nonstationary. I apply four variants of the synthetic control method to a panel data set of housing price indexes of 35 Chinese small and medium cities both before and after taking first difference to examine whether the inter-Korean rapprochement in early 2018 has appreciated the housing price in the Chinese border city Dandong. In my empirical context, I show that the synthetic control estimation results after taking first difference are more trustworthy, and, numerically, the reduction in tensions on the Korean Peninsula increased Dandong's housing price by approximately 8.5% in the second quarter of 2018, but there has been no further appreciation afterwards.

On testing for predictor effect in quantiles

Shengtao Dai, Peking University

Xiaojun Song, Peking University

Zhijie Xiao, Boston College

Abstract: This paper aims for checking the presence of relevant variables in quantiles, including singleton, interval and whole quantile levels. We suggest several nonparametric tests constructed with different types of weight functions. We then propose nonparametric projection methods to eliminate the estimation effect, which can also facilitate a convenient multiplier bootstrap procedure to simulate the critical values. Compared with wild bootstrap, our projection-based multiplier bootstrap procedure is feasible and accurate in the more general context of interval quantiles. We derive the asymptotic properties of our tests under the null, fixed alternative and a sequence of local alternatives converging to the null with a parametric rate of $n^{-1/2}$. Simulation evidence demonstrates excellent finite sample performance of our tests under the three cases. An empirical application is included for checking the variable relevance to the change in average log wage and manufacturing employment, respectively.

Session VI

Simulation-based inference to the joint model of longitudinal and event-time data with complexity arising from missing longitudinal observation

Xiaoqi Zhang, Chinese Academy of Social Science

Zhijun Zhao, Chinese Academy of Social Science

Yanqiao Zheng, Zhejiang University of Finance and Economics

Xiaobing Zhao, Zhejiang University of Finance and Economics

Abstract: Joint models of longitudinal and event-time data have been extensively studied and applied to many fields. Estimation of such joint models is challenging as it has to handle the complexity arising from the potential missing of the longitudinal data. Existing procedures are computationally expensive and their effectiveness relies heavily on data quality. In this study, a novel simulation-based procedure is proposed to estimate a general family of joint models,

which include many widely-applied joint models as special cases. Our procedure can easily handle low-quality data where longitudinal observations are systematically missing for some covariates. In addition, our inference procedure is implementable through parallel computing, so it is perfectly applicable to massive data in finance. The consistency and asymptotic normality of our estimators can be verified. Numerical experiments with both synthetic datasets and a real consumer-loan dataset are carried out to illustrate the effectiveness of the procedure.

Modeling and Forecasting Realized Volatility with the Fractional Ornstein-Uhlenbeck Process

Xiaohu Wang, Fudan University

Weilin Xiao, Zhejiang University

Jun Yu, Singapore Management University

Abstract: This paper proposes to model and forecast realized volatility (RV) using the fractional Ornstein-Uhlenbeck (fO-U) process with a general Hurst parameter, H. A two-stage method is introduced for estimating parameters in the fO-U process based on discrete-sampled observations. In the first stage, H is estimated based on the ratio of two second-order differences of observations from different frequencies. In the second stage, with the estimated H, the other parameters of the model are estimated by the method of moments. All estimators have closed-form expressions and are easy to implement. A large sample theory of the proposed estimators is derived. Extensive simulations show that the proposed estimators and the large sample theory perform well in finite samples. We apply the model and the method to the logarithmic daily RV series of various financial assets. Our empirical findings suggest that H is much smaller than 1/2, indicating that the RV series have rough sample paths, and that the mean reversion parameter takes a small positive number, indicating that the RV series are stationary but have slow mean reversion. The proposed model is compared with many alternative models, including the fractional Brownian motion, ARFIMA, and HAR, in forecasting RV.

Multivariate Stochastic Volatility Models based on Generalized Fisher Transformation

Han Chen, Hunan University

Yijie Fei, Singapore Management University

Jun Yu, Singapore Management University

Abstract: Modeling multivariate stochastic volatility (MSV) faces a few challenges when both variances and covariances are time-varying. The main challenges come from the assurance of positive-definiteness of the variance-covariance matrix and the statistical analysis of MSV models. In this paper, we introduce a new MSV model which is based on the generalized Fisher transformation of Archakov and Hansen (2018). This specification is highly flexible where the variance-covariance matrix is always positive-definiteness. Moreover, driving factors of volatilities and correlations are separated in the model. A Particle Gibbs Ancestor Sampling (PGAS) method is proposed to conduct Bayesian analysis of the model. The method facilitates the Bayesian model comparison. The MSV model and the estimation method are extended to include realized measures. Simulation studies show that the proposed method works well for the MSV model. Empirical studies based on exchange-rate and equity returns suggest that the proposed MSV model provides superior in-sample and out-of-sample performance over alternative specifications.

Session VII

Bootstrap Inference for Quantile Treatment Effects in Randomized Experiments with Matched Pairs

Liang Jiang, Fudan University

Xiaobin Liu, Zhejiang University

Peter C.B. Phillips, Yale University, University of Auckland, University of Southampton, Singapore Management University

Yichong Zhang, Singapore Management University

Abstract: This paper examines methods of inference concerning quantile treatment effects (QTEs) in randomized experiments with matched-pairs designs (MPDs). We derive the limit distribution of the QTE estimator under MPDs, highlighting the difficulties that arise in analytical inference due to parameter tuning. It is shown that both the naive multiplier

bootstrap and the naive multiplier bootstrap of the pairs fail to approximate the limit distribution of the QTE estimator under MPDs because they do not preserve the dependence structure within the matched pairs. To address this difficulty we propose two bootstrap methods that can consistently approximate the limit distribution: the gradient bootstrap and the multiplier bootstrap of the inverse propensity score weighted (IPW) estimator. The gradient bootstrap is free of tuning parameters but requires knowledge of the pair identities. The multiplier bootstrap of the IPW estimator does not require such knowledge but involves one tuning parameter. Both methods are straightforward to implement and able to provide pointwise confidence intervals and uniform confidence bands that achieve exact limiting coverage rates. We demonstrate their finite sample performance using simulations and provide an empirical application to a well-known dataset in macroinsurance.

Pollution and the Decline in Human Cognition: Evidence from China

Lanlin Ding, Xi’an Jiaotong University

Maoyong Fan, Ball State University

Peng Nie, Xi’an Jiaotong University

Abstract: We use a regression discontinuity design to investigate the long-term causal impact of PM2.5 on cognition ability among middle-aged and older adults in China. We find that the Huai River Policy increased PM2.5 by 22.8 μg/m3 and the long-term PM2.5 exposure has large and significant negative impact on mental intactness, mathematical ability, episodic memory, and overall cognitive ability. The results are robust to a series of robustness checks and economically significant. Our back-of-the-envelope calculations suggest that one-SD increase in PM2.5 is linked to an annual economic loss of $23.9 billion due to increased medical expenditures treating mental illness, and reducing PM2.5 to the WHO standard would save roughly $34.7 billion annually.

School district housing premium and education reform effect measurement

Zhijing Wang, Beijing Normal University

Yuchen Wu, Beijing Normal University

Xun Zhang, Beijing Normal University

Abstract: The housing premium of school districts in Beijing and the effect of education reform are hot topics closely related to people's livelihood. This paper uses the panel data of second-hand housing repeat transactions in Beijing from 2013 to 2019 to estimate the housing premium in school districts and the effect of education reform. This paper uses the two-way fixed effects model to estimate that the premium of "school district housing" is 6.46%. And the premium of small-sized apartment and school district housing outside the fourth circle will be higher. At the same time, the DID is used to measure the effect of education reform, and it is found that the school education reform will make the housing premium in the nearby school district 5.77%, while the premium of small family housing is higher than that of large family housing, the premium effect of vertical reform is higher than that of horizontal reform, and the premium of houses outside the fourth ring is higher than that of houses inside the fourth circle. Through the parallel trend test, we find that the school district housing premium brought by the reform has a certain time lag. In addition, the premium of education reform on promoting key schools is more obvious than that of non-key schools. It is called “Matthew effect for education reform”. Our study has a certain guiding significance for the study of the school district housing premium and the effect of education reform.

Session VIII

Estimation of a jump discontinuity in nonparametric regression

Carlos Martins-Filho, University of Colorado Boulder

Sihong Xie, Seattle University

Feng Yao, West Virginia University

Abstract: We propose a new class of estimators for a jump discontinuity on a nonparametric regression. While there is a vast literature in econometrics that addresses this issue (see, Hahn et al., 2001; Porter, 2003; Imbens and Lemieux, 2008), the main approach in these studies is to use local polynomial (linear) estimators on both sides of the discontinuity to produce an estimator for the jump. Our novel approach extends the regression from both sides of the discontinuity using the method proposed by Hestenes (1941). The extended regressions are then estimated and used to construct an estimate of the jump discontinuity. Our method is inspired by Mynbaev and Martins-Filho (2019) where a simple and elegant solution to boundary problems in density estimation is obtained using the same extension principle. Our work provides a class of jump estimators that are easy to construct using classical kernels and bandwidths that are constant over the entire domain of the regression. We provide asymptotic characterizations for the jump estimators in the class, including bias and variance orders, and asymptotic distributions after suitable centering and normalization.

A flexible stochastic production frontier model with panel data

Taining Wang, Capital University of Economics and Business

Feng Yao, West Virginia University

Subal C. Kumbhakar, Binghamton University

Abstract: We propose a flexible stochastic production frontier model with fixed effects for the panel data in which the semiparametric frontier is additive with bivariate interactions. Instead of maintaining distributional assumptions, we model the conditional mean of the inefficiency to depend on environmental variables and to be known up to a vector of parameters. We propose a difference-based estimator for parameters characterizing the conditional mean of the inefficiency term, a profile series estimator and a kernel-based one-step backfitting estimator for the frontier to facilitate inference. We establish their asymptotic properties, and show that each component in the frontier estimated by the kernel-based backfitting has the same asymptotic distribution as that estimated with the true knowledge on the other components in the frontier (i.e., the oracle property). Through a Monte Carlo study, we demonstrate that the proposed estimators perform well in finite samples. Through an application, we illustrates their applicability in estimating the frontier and obtaining the efficiency score.

Are Chinese firms borrowing externally too much? Evidence from a nonparametric panel threshold regression

Jinjing Tian, Dongbei University of Finance and Economics

Taining Wang, Capital University of Economics and Business

Feng Yao, West Virginia University

Abstract: We probe the excessive external financing problem in Chinese industrial firms by

investigating the potential threshold effect of leverage ratio on firms' total factor productivity (TFP). We hypothesize a threshold of leverage ratio which maximizes firms' productivity, and the threshold may differ with firm ownerships. To empirically test our hypotheses, we propose a nonparametric panel threshold regression model, which estimates the unknown threshold with fixed effects and endogenous variables and imposes no restrictions on the functional form of regression. We find excessive leverage ratio in Chinese firms relative to its threshold, which significantly restrains productivity growth. The threshold also varies with ownerships, particularly in state-owned enterprises (SOEs) whose leverage ratio exceeding the threshold negatively impacts firm's productivity. As a result, regions with a higher share of SOEs experience stagnant growth of productivity. Our results are fairly robust to the potential endogeneity of leverage ratio and an alternative measure of external financing.

Nonparametric Identification of Bayesian Games under Exclusion Restrictions

Tong Li, Vanderbilt University

Jun Zhang, University of Technology Sydney

Jun Zhao, Vanderbilt University

Abstract: This paper studies the identification problem for Bayesian games within the private type paradigm when researchers cannot perfectly know players' payoff structures. We first show that the benchmark framework is not nonparametrically identified without further restrictions. We then impose the exclusion restriction in the form of an exogenous players' participation, and establish nonparametric point or partial identification results. Specifically, we show that if the distributions of actions intersect with each other when the number of players varies, the model primitives, namely, the private type distribution and the unknown structure, are nonparametrically identified up to a scale. Otherwise, they are partially identified as they can be bounded nonparametrically. Our results can be extended to allow for corner solutions, asymmetric players, unobserved heterogeneity, and endogenous participation.