

TOPICS IN ECONOMETRICS

Instructor: José Luis Montiel Olea (Pepe).

Description: This course presents a one-week overview of three important concepts in the theory of linear and non-linear models defined by moment conditions: *Identification, Weak Identification and Partial Identification*.

Pre-requisites: I will assume you are familiar with the following concepts:

- **Probability** Probability spaces, random variables, stochastic process (at least the definition), convergence of random variables (“ $\xrightarrow{a.s.}$ ”, “ \xrightarrow{p} ”, “ \xrightarrow{d} ”), the weak law of large numbers and the Central Limit Theorem (for i.i.d. processes).
References: [Billingsley \(1995\)](#), [Dudley \(2002\)](#)
- **Statistics:** Sufficiency, Hypothesis Testing, Size, Power, Neyman-Pearson Lemma, Maximum Likelihood Estimation (MLE), Asymptotic properties of MLE estimators. Confidence Intervals.
References: [Ferguson \(1967\)](#)
- **Econometrics:** Gaussian i.i.d. OLS model with fixed regressors, basic asymptotic properties of the OLS estimator, Robust Standard Errors.
References: [Hayashi \(2000\)](#), Chapter 2

Course Objectives: I will present and discuss the Instrumental Variables (IV) regression model and the Generalized Method of Moments (GMM) procedure. I will use this framework to study *Identification, Weak Identification and Partial Identification*. At the end of this week, the students should be able to understand the relevance of these concepts in econometric practice.

The course will be self-contained. The references listed below are not mandatory for the lecture: rather, they are supplementary material for those interested in delving into the concepts that I will cover during the class.

Course Outline:

Monday 3 hours

- Identification and the Instrumental Variable set-up. Motivation and examples: a) Demand estimation and endogeneity in a structural set-up. b) Returns to Education: endogeneity and unobserved characteristics.
References: [Angrist and Krueger \(2001\)](#)

- The Fixed-Regressors Gaussian IV model: Exact finite sample properties.
References: [Andrews, Moreira, and Stock \(2006\)](#) (Section 2), [Moreira \(2009\)](#)
- Standard (“Strong”) Asymptotic Properties of the IV estimator.
References: [Hayashi \(2000\)](#), Chapter 3

Tuesday 3 hours

- Weak Instruments in IV regression: Bias of the TSLS and size distortion of the Wald Statistic. Properties of the Limited Information Maximum Likelihood estimator (LIML)
References: [Bound, Jaeger, and Baker \(1995\)](#)
- Weak Instrument Asymptotics: Beyond the Gaussian framework.
References: [Staiger and Stock \(1997\)](#)
- Pre-testing strategies. “ $F > 10$ ” and the relevance of the first-stage. Effective F: A new “robust” pre-testing strategy: departures from the i.i.d. conditionally homoskedastic set-up.
References: [Stock and Yogo \(2005\)](#), [Montiel and Pflueger \(2011\)](#)
- Robust Inference Procedures. A really clever idea: The Conditional Likelihood Ratio and a optimality result for the i.i.d conditionally homoskedastic set-up.
References: [Andrews et al. \(2006\)](#)

Wednesday 3 hours

- The Generalized Method of Moments. Standard Asymptotic Theory.
References: [Hayashi \(2000\)](#)
- A popular non-linear GMM model: BLP’s random coefficient logit model.
References: [Berry, Levinsohn, and Pakes \(1995\)](#), [Berry \(1994\)](#)
- Inference problems in the BLP set-up: A weakly identified non-linear model?
References: [Knittel and Metaxoglou \(2008\)](#)

Thursday 3 hours

- Weak Identification in GMM models.
References: [Stock and Wright \(2000\)](#)
- Multiple Solutions in weakly identified GMM models.
- The Continuous Updating Estimator (CUE).
References: [Hansen, Heaton, and Yaron \(1996\)](#)

Friday 3 hours

- Partially Identified Models: Moment Inequalities.
References: [Chernozhukov, Hong, and Tamer \(2007\)](#), [Pakes \(2010\)](#), [Pakes, Porter, Ho, and Ishii \(2006\)](#), [Kaido and Santos \(2011\)](#).
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Office Hours: By appointment.

Grade Policy: TBA.

Grading: TBA

Homework: TBA.

References

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- HANSEN, L., J. HEATON, AND A. YARON (1996): “Finite-sample properties of some alternative GMM estimators,” *Journal of Business & Economic Statistics*, 14, 262–280.
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- KAIDO, H. AND A. SANTOS (2011): “Asymptotically Efficient Estimation of Models Defined by Convex Moment Inequalities,” .

- KNITTEL, C. AND K. METAXOGLU (2008): “Estimation of random coefficient demand models: Challenges, difficulties and warnings,” .
- MOREIRA, M. (2009): “Tests with correct size when instruments can be arbitrarily weak,” *Journal of Econometrics*, 152, 131–140.
- PAKES, A. (2010): “Alternative models for moment inequalities,” *Econometrica*, 78, 1783–1822.
- PAKES, A., J. PORTER, K. HO, AND J. ISHII (2006): “Moment inequalities and their application,” *Unpublished Manuscript*.
- STAIGER, D. AND J. STOCK (1997): “Instrumental variables regression with weak instruments,” *Econometrica*, 65, 557–586.
- STOCK, J. AND J. WRIGHT (2000): “GMM with weak identification,” *Econometrica*, 68, 1055–1096.
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