TOPICS IN ECONOMETRICS

NON- AND SEMI-PARAMETRIC INFERENCE

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This topics course intends to advice Ph.D. students interested in using data in their applied research. The course is organized in three parts. The first part discusses the fundamentals of inference on nonparametric and semi-parametric models, which includes formal justification of smoothing techniques for probability density and regression, as well as inference on integrated curves, like the cumulative distribution function and the integrated regression. Then, we discuss popular semi-parametric models in econometrics, which use preliminary smooth estimators, e.g. index models and partially linear models, and others that avoid smoothing, like quantile and distributional regression. The second part of the curse discusses specification testing based on classical statistics (chi-squared tests) as well as tests using empirical processes and smoothing techniques.

The course will be evaluated on the basis of an essay on one some of the discussed topics, which must always involve numerical work, either simulations or real data.

Notes on each topic, which form the basis for the lectures, will be provided. We also provide below a list of relevant references for consultation.

Syllabus

1. Inference on lebesgue densities and regression curves.
2. Inference on semiparametric models.
3. Specification testing using grouped data: Chi-squared tests.
4. Omnibus specification testing: Empirical processes and smoothing.

Reading List

Non- and semi-parametric inference

Härdle, W (1986): Applied Nonparametric Regression, Cambridge Univ. Press.

Koenker, R. (2005). Quantile Regression, no. 9780521845731 in Cambridge Books.

Lee, M-j (1996): Methods of Moments and Semiparametric Econometrics for Limited Variable Models, Springer.

Li Q, Racine JS. Nonparametric Econometrics: Theory and Practice (2007): Princeton University Press.

Silverman, B. (1986): Density Estimation for Statistic and Data Analysis, Chapman Hall.

Tsybakov, A.E (2009): Introduction to Nonparametric Estimation, Springer.

Simonov, J.S. (1996): Smoothing Methods in Statistics, Springer.

Wand, M.P. and M.C. Jones (1995): Kernel Smoothing, Chapman & Hall.

Chi-squared tests

Monographs:

Balakrishnan, N., Voinov, V. & Nikulin, M. S. (2013). Chi-squared goodness of fit tests with applications. Academic Press.

Bickel, P.J. and K.A. Doksum (2015): Mathematical Statistics: Basic Ideas and Selected Topics. Vol. I. Chapman & Hall. Chapter 6.4.

Lehmann, E.L. and J.P. Romano (2005). *Testing Statistical Hypotheses*. Springer-Verlag.

Read, T. R. C. and N. A. C. Cressie (1988): Goodness-of-Fit Statistics for Discrete Multivariate Data, New York: Springer.

Greenwood, P.E. and M.S. Nikulin (1996): A Guide to Chi-Squared Testing. Wiley.

Selected references

Andrews, D.W.K. (1988a): Chi-square diagnostic tests for econometric models: Introduction and applications, Journal of Econometrics, 37, 135-156.

Andrews, D.W.K. (1988b): Chi-square diagnostic tests for econometric models: Theory, Econometrica, 56, 1419-1453.

Delgado, M.A. and J. Vainora (2019): A Pearson's Test for Conditional Distribution Model Checking. Mimeo. UC3M.

Horowitz, J.L. (1985): Testing probabilistic discrete choice models of travel demand by comparing predicted and observed aggregate choice shares. Transportation Research,-B, 19-B, 17-38.

McFadden, D. (1974): Conditional Logit Analysis of Qualitative Choice Behaviour, Frontiers of Econometrics, ed. by P. Zarembka. New York: Academic Press.

Heckman, J.J. (1984): The χ^2 goodness of fit statistic for models with parameters estimated from microdata, Econometrica, 1543-1547.

Omnibus specification testing:

Monographs:

D'Agostino, R.B. and M.A. Stephens (1986): Goodness-of-fit techniques. Marcel Dekker.

Gänssler, P. and W. Stute (2013). Seminar on empirical processes. Birkhäuser.

Hart, J. (1993): Nonparametric Smoothing and Lack-of-Fit Tests. Springer.

Lehmann, E.L. and J.P. Romano (2005). *Testing Statistical Hypotheses*. Springer-Verlag.

Shorack , G.R. & J.A. Wellner (1986). Empirical Process with Applications to Statistics. John Wiley.

Selected References:

Andrews, D. W. K.(1997): A conditional Kolmogorov test, Econometrica, 65, 1097--1128.

Bickel, P.J. and M. Rosenblat (1973): On Some Global Measures of the Deviations of Density Function Estimates, Annals of Statistics, 1, 1071-1095.

Bierens, H. and W. Ploberger (1997): Asymptotic theory of integrated conditional moment tests, Econometrica, 65, 1129--1151.

Chen, X. and Y. Fan (1999): Consistent hypothesis testing in semiparametric and nonparametric models for econometric time series, Journal of Econometrics, 91, 373--401.

Delgado, M., M. A. Domínguez and P. Lavergne (2006). Consistent tests of conditional moment restrictions. Annales d'Economie et de Statistique, 81(1), 33-67.

Delgado (2010): On testing conditional moment restrictions. Structural Econometrics: Essays in Methodology and Applications, B. Dutta ed., Oxford University Press, Oxford., 285-313.

Delgado, M. and W. González-Manteiga (2001): Significance testing in nonparametric regression based on the bootstrap, The Annals of Statistics, 29, 1469-1507.

Delgado, M.A., Hidalgo, J. and Velasco, C. (2005): Distribution free goodness-of-fit tests for linear processes,. The Annals of Statistics, 33, 2568-2609.

Delgado, M.A. and T. Stengos (1994): Semiparametric testing in non-nested econometric models, Review of Economic Studies, 303, 291-303.

Delgado, M.A., Stute, W., (2008): Distribution-free specification tests of conditional models, Journal of Econometrics 143, 37 55.

Escanciano, J.C. (2007): Weak convergence of non-stationary multivariate marked processes with applications to martingale testing, Journal of Multivariate Analysis, 98, 1321-1336.

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Fan, Y. and Q. Li (2000): Consistent model specification tests. Econometric Theory, 16, 1016-1041.

Gänssler, P., & Stute, W. (1979). Empirical processes: a survey of results for independent and identically distributed random variables. The Annals of Probability, 7(2), 193-243.

Härdle, W. and E. Mammen (1993): Comparing nonparametric versus parametric regression fits, The Annals of Statististics, 21, 1926-1947.

Horowitz, J.L. and V.G. Spokoiny (2001): An adaptive, rate-optimal test of a parametric model against a nonparametric alternative, Econometrica, 69(3), 599--631.

Koul, H. L. and Stute, W. (1999): Nonparametric Model Checks for Time Series,The Annals of Statistics, 27, 204--236.

Lavergne, P. and Q. H. Vuong (2000): Nonparametric significance testing, Econometric Theory, 16, 576--601.

Li Q. and S. Wang (1998): A simple consistent bootstrap test for a parametric regression function, Journal of Econometrics, 87, 145--165.

Robinson, P.M. (1989): Hypothesis testing in semiparametric and nonparametric models for econometric time series, The Review of Economic Studies, 56, 511-534.

Rosenblatt M. (1975): A quadratic measure of deviation of two-dimensional density estimates and a test of independence, The The Annals of Statistics, 3, 1-14.

Stute, W. (1997): Nonparametric model checks for regression, The Annals of Statistics 25 613-641.

Stute, W., W. Gonzalez-Manteiga and M. Presedo (1998): Bootstrap Approximations in Model Checks for Regression, Journal of the American Statistical Association, 93, 141-149.

Stute, W., Thies, S. and Zhu, L.-X. (1998): Model checks for regression: an innovation process approach, The Annals of Statistics, 26, 1916-1934.

Stute, W. and Zhu, L.-X. (2005): Nonparametric checks for single-index models. The Annals of Statistics, 33, 1048-1083.

Zheng, X. (1996): A consistent test of functional form via nonparametric estimation techniques, Journal of Econometrics, 75, 263-289.

Zheng, X. (1998): A consistent nonparametric test of parametric regression models under conditional quantile restrictions, Econometric Theory, 14, 123-138.