

VICTOR CHERNOZHUKOV

Ford International Professor

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EDUCATION

Stanford University, Ph.D. Economics, 2000. Dissertation: Conditional Extremes and Near-Extremes: Concepts, Inference, and Economic Applications. Committee: T. Amemiya, P. Bajari, T. MaCurdy.

University of Illinois at Urbana-Champaign, M.S. Statistics, 1997

CURRENT ACADEMIC POSITIONS

Massachusetts Institute of Technology, Department of Economics & Center for Statistics and Data Science, Professor, 2008-present; on leave in 2018.

New Economic School, Moscow, Professor by Courtesy, 2010-present

PREVIOUS ACADEMIC POSITIONS

University of Chicago, Department of Economics, Visiting Associate Professor, Spring 2007

Massachusetts Institute of Technology, Department of Economics, Associate Professor (with tenure), 2005-2008

Massachusetts Institute of Technology, Department of Economics, Assistant Professor, 2000-2005

ACADEMIC SERVICE

Co-author of the Dual Ph.D. degree in Statistics + X at MIT — new Interdisciplinary Ph.D. program by the MIT's Institute for Data, Systems, and Society and Departments of Economics, Mathematics, Political Science, and others;

Co-author of the new B.S. degree 6-14 in Computer Science, Economics, and Data Science at MIT;

Co-author of the Minor in Statistics for B.S. degree candidates at MIT.

Co-organizer and co-founder of the MIT Stochastics and Statistics Seminar.

Co-adviser to Doctoral and Post-Doctoral Scholars. Christian Hansen, Allen Ferrell, Ivan Fernandez-Val, Alfred Galichon, Alexandre Belloni, Konrad Menzel, Igor Makarov, Mathew Harding, Oleg Rytchkov, Moshe Cohen, Paul Schrimpf, Arun Chandrasekhar, Denis Chetverikov, Blaise Melly, Kengo Kato, Kaspar Wuthrich, Tetsuya Kaji, Vira Semenova, Yaroslav Mukhin, Mert Demirer, + current students.

Co-founder of the Structural Reading Group at MIT Economics. A reading group for graduate students at MIT Economics focusing on structural methods and structural equation modelling.

Co-Author of the Online Professional Education Class at the MIT xPro platform: "Data Science: Data to Insights," 2015-present

Instructor in Summer and Short Courses on "Machine Learning for Causal and Structural Inference", NBER, St. Gallen, Ljubljana University, The Swiss Bank Study Center at Gerzensee, Georgetown University, CEMMAP (for many years).

Inaugural Moderator of the Economics (Econometrics) ArXiv (launch September 2017).

Co-Editor for Econometrics Journal; Economic Theory; Econometric Theory (past).

Co-Author of a new editorial policy for Econometrics Journal, meant to have papers focusing on key ideas, while dramatically shortening the submission-to-publication times.

INDUSTRY SERVICE

Amazon. Com (Core Artificial Intelligence); Senior Principal Scientist; 2018-2019
Amazon. Com (Central Economics); Independent Consultant on Data Analytics, 2015-2018
The State Street Corporation (Operational Risk Division); Independent Consultant, 2009-2012;

AWARDS and HONORS

Fisher-Shultz Lecture, Econometric Society, to be given in 2019.
Bessel Award, Humboldt Foundation, Awarded in 2018.
American Academy of Arts and Sciences, Fellow, Elected in 2016.
E.J. Hannan Lecture, The Australasian Econometric Society Meeting, 2016
Best Graduate Teacher, MIT Economics Department, Elected by Economics Graduate Student Association, 2015.
Inaugural Cowles Foundation Lecture, North American Econometric Society Meeting, 2009
Fellow of the Econometric Society, Elected in 2009
International Fellow, University College London, CEMMAP, 2009-present
Alfred P. Sloan Research Fellowship, 2005-2007
Castle-Krob Career Development Chair, 2004-2007
Arnold Zellner Award, 2005;
Selection Committee: D. Andrews, B. Hansen, G. Koop, and A. Lewbel.
Alfred P. Sloan Doctoral Dissertation Fellowship, 1999-2000
American Collegiate Consortium Scholarship, 1993-1994

MAJOR GRANTS

National Science Foundation, 2002-2018

RESEARCH

- I. **Causal Inference with High-Dimensional Data Using Machine Learning.** Modeling, estimation, and inference with high-dimensional data in economics. Focus on program evaluation and causal inference with high-dimensional data using modern statistical methods a.k.a. "machine learning." Empirical Applications.
[24, 25, 26, 27, 30, 31, 34, 36, 37, 38, 39, 40, 41, 42, 45, 47, 50, 51, 53, 54, 55, 57, 58, 60, 61, 62, 63, 64, 68, 69, 70, 72, 74, 75, 76, 77, 79, 84, 86, 87, 88, 89, 92, 93, 94, 95, 96, 97, 99, 100]
- II. **Quantile and Distributional Methods in Economics.** Instrumental quantile methods. Quantile and distribution regressions. Counterfactual analysis. Empirical Applications.
[2, 5, 6, 9, 10, 12, 16, 18, 21, 24, 29, 32, 33, 35, 44, 45, 48, 52, 56, 57, 59, 64, 65, 67, 69, 71, 72, 73, 75, 78, 80, 81, 83, 85, 90]
- III. **Moment Inequalities, Partial Identification, Set Estimation.** Set identification analysis, estimation, and inference in partially identified models, especially moment inequality models.
[13, 14, 15, 16, 22, 27, 28, 29, 43, 46, 49, 52, 66, 68, 81, 85, 98]
- IV. **Quasi-Bayesian Estimation.** A computationally attractive alternative to the extremum estimation in structural econometric models. Computational complexity analysis. Sandwich formulas to correct Bayesian inference.
[3, 4, 18, 38]
- V. **Shape Restrictions in Econometric Models.** Exploiting shape restrictions to improve estimation and inference on structural functions, including conditional and structural quantile functions, growth curves, and Edgeworth and Cornish-Fisher expansions.
[19, 20, 21, 66, 72, 73, 82]

- VI. **Extremes and Nonstandard Models.** Model and inference for extreme and near-extreme conditional quantiles. Applications to market and birthweight risks. Estimation and inference in models of equilibrium search, standard auction models, and production frontiers.
[1, 4, 7, 23]

BOOKS

Handbook of Quantile Regression; with Roger Koenker et. al.; 2017; CRC Press.

Modern Data Analysis in Economics: A First Course, (draft); with I. Fernandez-Val;

Machine Learning of Structural, Causal, and Treatment Effects; with C. Hansen and M. Spindler; in preparation

PAPERS (papers dated after 2007 are available via [ARXIV.ORG](https://arxiv.org))

1. "Conditional Value-at-Risk: Aspects of Modeling and Estimation," with L. Umantsev, **Empirical Economics**, 26, pp. 271-293, 2001.
2. "Three-step Censored Quantile Regression and Extramarital Affairs," with H. Hong, **Journal of the American Statistical Association**, 2002.
3. "An MCMC Approach to Classical Estimation," with H. Hong, **Journal of Econometrics**, 2003.

Awarded the 2005 Biannual Arnold Zellner Award.
Selection Committee: D. Andrews, B. Hansen, G. Koop, and A. Lewbel.
4. "Likelihood Inference in a Class of Non-Regular Econometric Models," with H. Hong, **Econometrica**, vol.72 (2), pp. 1445-1480, 2004.
5. "The Impact of 401(k) Participation on the Wealth Distribution: An Instrumental Quantile Regression Analysis," with C. Hansen, **The Review of Economics and Statistics**, 2004.
6. "An Instrumental Variable Model of Quantile Treatment Effects," with C. Hansen, **Econometrica**, 2005.
7. "Extremal Quantile Regression," **The Annals of Statistics**, 2005.
8. "Subsampling Inference on Quantile Regression Processes (with an Application to a Re-employment Experiment)," with I. Fernandez-Val, **Sankhya**, 2005.
9. "Inference on Instrumental Quantile Processes for Structural and Treatment Effect Models," with C. Hansen, **Journal of Econometrics**, 2006.
10. "Quantile Regression under Misspecification and the U. S. Wage Structure," with J. Angrist and I. Fernandez-Val, **Econometrica**, 2006.
11. "Estimation and Inference on Parameter Sets in Econometric Models," with H. Hong and E. Tamer, **Econometrica**, 2007.
12. "Extremal Quantiles and Value-at-Risk," with Songzi Du, 2007, **Palgrave Dictionary of Economics**.

13. "Instrumental Variable Identification and Estimation of Non-separable Models," 2007, with G. Imbens and W. Newey, **Journal of Econometrics**.
14. "The Reduced Form: A Simple Approach to Inference with Weak Instruments," with C. Hansen, **Economics Letters**, 2007.
15. "Instrumental Quantile Regression: A Robust Inference Approach," C. Hansen, **Journal of Econometrics**, 2007.
16. "Finite-Sample Inference in Quantile Regression Models," with C. Hansen and M. Jansson, **Journal of Econometrics**, 2007.
17. "Admissible Tests for Instrumental Regression," with C. Hansen and M. Jansson, **Econometric Theory**, 2008.
18. "Computational Complexity of MCMC-Based Estimators in Large Samples," with A. Belloni, **The Annals of Statistics**, 2009.
19. "Improving Point and Interval Estimators of Monotonic Functions by Rearrangement," with I. Fernandez-Val and A. Galichon, **Biometrika**, 2009.
20. "Quantile and Probability Curves without Crossing," with I. Fernandez-Val and A. Galichon, **Econometrica**, 2010.
21. "Rearranging Edgeworth-Cornish-Fisher Expansions," with I. Fernandez-Val and A. Galichon, **Economic Theory**, 2010.
22. "Sensitivity and Set-Identification Analysis of the Regression Model with Tobin Regressors," with T. Stocker and R. Rigobon, **Quantitative Economics**, 2010.
23. "Inference for Extremal Quantile Regression Models, with an Application to Market and Birthweight Risks," with I. Fernandez-Val, **The Review of Economic Studies**, 2011.
24. "L1-Penalized Quantile Regression in High-Dimensional Sparse Models," with A. Belloni, **The Annals of Statistics**, 2011.
25. "High-Dimensional Sparse Econometric Models: An Introduction," with A. Belloni, **Springer Lecture Notes**, 2011. (Refereed)
26. "Square Root Lasso: Pivotal Recovery of Sparse Functions via Conic Programming," with A. Belloni and L. Wang, **Biometrika**, 2011.
27. "Sparse Models and Methods for Instrumental Regression with Application to Eminent Domain," with A. Belloni, C. Hansen, D. Chen, **Econometrica**, 2012.
28. "Intersection Bounds: Estimation and Inference," with S. Lee and A. Rosen, **Econometrica**, 2013.
29. "Average and Quantile Effects in Nonlinear Panel Data Models," with J. Hahn, I. Fernandez-Val, W. Newey, **Econometrica**, 2013.
30. "Least Squares after Model Selection in High-Dimensional Linear Regression Model," with A. Belloni, **Bernoulli**, 2013. (Arxiv 2009).

31. "Inference Methods for High-Dimensional Sparse Econometric Models," with A. Belloni and C. Hansen, World Congress of Econometric Society 2010, **Advances in Economics and Econometrics**, 2011.

Invited lecture presented at the World Congress of Econometric Society in 2010, with discussion by S. Bonhomme.
32. "Quantile Models with Endogeneity"; with C. Hansen, invited article, **Annual Review of Economics**, (5) 2013.
33. "Inference on Counterfactual Distributions," I. Fernandez-Val and B. Melly, **Econometrica**, 2013.
34. "Gaussian Approximations and Gaussian Multiplier Bootstrap for Maxima of Sums of High-Dimensional Random Vectors"; with D. Chetverikov and K. Kato, **Annals of Statistics**, 2013
35. "Identification in Semiparametric and Nonparametric Conditional Moment Models", with X. Chen, S. Lee, and W. Newey, **Econometrica**, 2014.
36. "Comparison and Anti-Concentration Bounds for Maxima of Gaussian Vectors"; with D. Chetverikov and K. Kato. **Probability Theory and Related Fields**, 2015 (ArXiv 2013)
37. "Inference on Treatment Effects with High-Dimensional Controls, with Application to Abortion and Crime"; with A. Belloni and C. Hansen. **The Review of Economic Studies**, 2014 (ArXiv 2011)
38. "Posterior Inference in Curved Exponential Families under Increasing Dimension"; with A. Belloni, **Econometrics Journal**, 2014.
39. "Pivotal Estimation via Square-Root Lasso in Non-parametric Regression"; with A. Belloni and L. Wang. **Annals of Statistics**, 2014. (Arxiv 2011)
40. "Inference on Structural and Treatment Effects with High-Dimensional Data"; with A. Belloni and C. Hansen. **Journal of Economic Perspectives**, 2014.
41. "Gaussian Approximation of Suprema of Empirical Processes"; with D. Chetverikov and K. Kato. **Annals of Statistics**, 2014.
42. "Anti-Concentration and Confidence Bands in Nonparametric Problems"; with D. Chetverikov and K. Kato. **Annals of Statistics**, 2014.
43. "Inference on Sets in Finance," with E. Kokatulum and K. Menzel, **Quantitative Economics**, 2015.
44. "Quantile Regression under Censoring and Endogeneity," with I. Fernandez-Val and A. Kowalski. **Journal of Econometrics**, 2015.
45. "Uniform Post-Selection Inference in LAD regression and other Z-estimation Problems"; with A. Belloni and K. Kato, **Biometrika**, 2014.
46. "Fragility of Asymptotic Agreement under Bayesian Learning," with D. Acemoglu and M. Yildiz. **Theoretical Economics**, 2015.
47. "Some New Asymptotic Theory for Least Squares Series Estimators"; with A. Belloni, D. Chetverikov, and K. Kato. **Journal of Econometrics**, 2015.

48. "Nonparametric Identification in Panels using Quantiles"; with I. Fernandez-Val, W. Newey et. al., **Journal of Econometrics**, 2015.
49. "Implementing Intersection Bounds in Stata"; with W. Kim, S. Lee, A. Rosen, **Stata Journal**, 2015.
50. "Post-Selection and Post-Regularization Inference in Large Linear Models with Many Controls and Instruments"; with C. Hansen and M. Spindler, **American Economic Review**, Papers and Proceeding, 2015
51. "Post-Selection and Post-Regularization Inference: An Elementary, General Approach"; with C. Hansen and M. Spindler, **Annual Review of Economics**, 2015.
52. "Censored Quantile Instrumental Variable Estimation with Stata"; with I. Fernandez-Val, Sukjin Han, Amanda Kowalski; Revision Requested, **Stata Journal**; ArXiv 2016
53. "Honest Confidence Regions for High-Dimensional Sparse Generalized Linear Models"; **Journal of Business and Economic Statistics**, 2016, with A. Belloni and W. Ying
54. "Inference on Treatment Effects with High-Dimensional Panel Data, with an Application to Gun Control"; **Journal of Business and Economic Statistics**, 2016, with D. Kozbur, and C. Hansen
55. "Empirical and Gaussian Bootstraps for Suprema of Empirical Processes of Increasing Complexity, and Related Gaussian Couplings"; with D. Chetverikov and K. Kato, **Stochastic Processes and Their Applications**, 2016. Memorial Issue in honor of Evarist Gine.
56. "Vector Quantile Regression"; with G. Carlier and A. Galichon, **Annals of Statistics**, 2016
57. "Program Evaluation with High-Dimensional Data"; with A. Belloni, C. Hansen, I. Fernandez-Val, **Econometrica**, 2017
58. "A Lava Attack on the Recovery of Sums of Sparse and Dense Signals"; with C. Hansen and Y. Liao, **Annals of Statistics**, 2017
59. "Monge-Kantorovich Depth, Quantiles, and Ranks"; with A. Galichon, M. Hallin, M. Henry, 2014, **Annals of Statistics**, 2017
60. "Central Limit Theorems and Bootstrap in High Dimensions"; with D. Chetverikov and K. Kato, 2015, **Annals of Probability**, 2017
61. "Double/Debiased/Neyman Machine Learning for Treatment Effects"; with Denis Chetverikov, Mert Demirer, Esther Duflo, Christian Hansen, and Whitney Newey, **American Economic Review, Papers & Proceedings**, 2017
62. "Double/De-Biased Machine Learning for Treatment and Causal Parameters"; with Denis Chetverikov, Mert Demirer, Esther Duflo, Christian Hansen, Whitney Newey, and James Robins, **Econometrics Journal**, 2018
63. "HDM: High-Dimensional Metrics"; an R-package at r-project.org, accompanied by a refereed paper published in **R Journal**, 2017, with C. Hansen, M. Spindler
64. "Quantreg.nonpar: An R Package for Performing Nonparametric Series Quantile Regression"; with M. Lipsitz, I. Fernandez-Val, A. Belloni; an R-package at r-project.org, accompanied by a refereed paper published in **R Journal**, 2017;

65. "Counterfactual: An R Package for Counterfactual Analysis", with Mingli Chen, Iván Fernández-Val, Blaise Melly; an R-package at r-project.org, accompanied by a refereed paper published in **R Journal**, 2018.
66. "Constrained Moment Conditions Models", submitted, with A. Santos and W. Newey, Revision Requested, **Econometrica**, 2016.
67. "The Sorted Effects Method: Discovering Heterogeneous Partial Effects Beyond Their Averages", with I. Fernandez-Val and Y. Luo, **Econometrica**, 2018.
68. "Inference on causal and structural parameters using many moment inequalities", with D. Chetverikov and K. Kato, Forthcoming, **Review of Economics Studies**, 2018+
69. "Robust Inference in Approximately Sparse Quantile Regression Models", with A. Belloni and K. Kato, Forthcoming, **Journal of the American Statistical Association**, 2018+
70. "Uniformly Valid Post-Regularization Confidence Regions for Many Functional Parameters in Z-Estimation Framework", with A. Alexandre Belloni, Victor Chernozhukov, Denis Chetverikov, Ying Wei; **Annals of Statistics**, 2018;
71. "Vector quantile regression beyond correct specification," with G. Carlier and A. Galichon, **Journal of Multivariate Analysis**, 2018
72. "Conditional Quantile Processes based on Series or Many Regressors (with an Application to Gasoline Demand)," with A. Belloni & D. Chetverikov & I. Fernandez-Val, ArXiv 2013. Forthcoming, **J. Econometrics**
73. "Generic Inference on Quantile and Quantile Effect Functions for Discrete Outcomes", with Iván Fernández-Val, Blaise Melly, Kaspar Wüthrich. Conditionally Accepted, **Journal of the American Statistical Association**, 2018
74. "Locally Robust Semi-parametric Estimation", with Juan Carlos Escanciano, Hidehiko Ichimura, Whitney K. Newey, James Robins; ArXiv; Revision Requested, **Econometrica**
75. "Quantile Graphical Models: Prediction and Conditional Independence with Applications to Systemic Risk", with A. Belloni and M. Chen; Submitted; ArXiv 2017
76. "Confidence Bands for Coefficients in High-Dimensional Linear Models with Errors-in-Variables," with A. Belloni, A. Kaul; ArXiv 2017, Revision Requested, **Annals of Statistics**;
77. "Pivotal Estimation via Self-Normalization for High-Dimensional Linear Models with Errors in Variables"; with A. Belloni, A. Kaul, M. Rosenbaum, A. Tsybakov; Revision Requested; **Annals of Statistics**; ArXiv 2017
78. "Nonseparable Multinomial Choice Models in Cross-Section and Panel Data"; with I. Fernandez-Val and W. Newey; ArXiv, Forthcoming, **Journal of Econometrics**;
79. "On Cross-Validated Lasso"; with D. Chetverikov and Z. Liao; ArXiv;
80. "Single Market Nonparametric Identification of Multi-Attribute Hedonic Equilibrium Models"; with A. Galichon M. Henry, B. Pass, 2015; ArXiv; submitted.

81. "Best Linear Approximations to Set-Identified Functions (with an Application to Gender Wage Gap)"; 2009, with A. Chandraksekhar, F. Molinari, and P. Schrimpf; ArXiv
82. "Shape-Enforcing Operators for Point and Intervals Estimators"; with Xi Chen, I. Fernandez-Val, Scott Kostyshak, and Y. Luo; ArXiv 2018.
83. "Network and Panel Quantile Effects via Distribution Regression"; with I. Fernandez-Val and M. Weidner; ArXiv 2018;
84. "Inference in High-Dimensional Sparse Linear Structural Equation Models"; with A. Belloni, C. Hansen, W. Newey; et. al.; ArXiv 2018
85. "Distribution Regression with Sample Selection, with an Application to the U.K. Wage Structure," with I. Fernandez-Val and Siyi Luo; ArXiv 2018;
86. "Simultaneous Inference for Best Linear Predictor of the Conditional Average Treatment Effect and Other Structural Functions"; with V. Semenova; ArXiv 2018
87. "Generic Machine Learning Inference on Heterogeneous Treatment Effects in Randomized Experiments"; with E. Duflo, M. Demirer; I. Fernandez-Val; ArXiv 2017
88. "Exact and Robust Conformal Inference Method for Counterfactual and Synthetic Controls"; with Yinchu Zhu and Kaspar Wuthrich; ArXiv 2017
89. "Orthogonal Machine Learning for Demand Estimation: High-Dimensional Causal Inference in Dynamic Panels," with V. Semenova, M. Goldman, M. Taddy; ArXiv 2017
90. "Semi-Parametric Estimation of Structural Functions in Nonseparable Triangular Models"; with I. Fernandez-Val, W. Newey, S. Stouli, Francis Vella; ArXiv 2017;
91. "Detailed Proof of Nazarov's Inequality"; with K. Kato and D. Chetverikov; 2017; for ArXiv only.
92. "The Impact of Big Data on Firm Performance: An Empirical Investigation"; with P. Bajari, A. Hortacsu, J. Suzuki, NBER Working Paper 2018.
93. "Exact and Robust Conformal Inference Methods for Predictive Machine Learning with Dependent Data"; with K. Wuthrich and Y. Zhu; **Computational Learning Theory (COLT)**, 2018.
94. "Double/Debiased Machine Learning with Regularized Riesz Representers"; with W. Newey and J. Robins; ArXiv 2018.
95. "High-Dimensional Econometrics and Regularized GMM"; forthcoming, **Handbook of Econometrics v7 (A)**, with A. Belloni, D. Chetverikov, C. Hansen, K. Kato; ArXiv 2019;
96. "Learning L_2 Continuous Regression Functionals via Regularized Riesz Representers"; with W. Newey and R. Singh; ArXiv 2018
97. "Valid Simultaneous Inference in High-Dimensional Settings" (with the hdm package for R); ArXiv 2019; with P. Bach and M. Spindler; ArXiv 2018
98. "Subvector Inference in Partially Identified Models with Many Moment Inequalities"; with A. Belloni and F. Bugni; ArXiv 2018

99. "LASSO-Driven Inference in Time and Space", with W. Hardle, C. Huang, W. Wang; ArXiv 2018

100. "Plug-in Regularized Estimation of High-Dimensional Parameters in Nonlinear Semiparametric Models", with D. Nekipelov, V. Semenova, V. Syrkganis; ArXiv 2018