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DOCTORAL STUDIES

Massachusetts Institute of Technology (MIT)
PhD, Economics, Expected completion June 2014
DISSERTATION: "Essays in Weak Identification and Econometrics"

DISSERTATION COMMITTEE AND REFERENCES

Professor Anna Mikusheva
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Professor Jerry Hausman
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PRIOR EDUCATION

Yale University	BA	Economics and Mathematics with Honors

CITIZENSHIP USA **GENDER:** Male

FIELDS Primary Fields: Econometrics

Secondary Fields: Finance, Public Finance, Theory

TEACHING EXPERIENCE	Statistical Methods in Economics (graduate) Teaching Assistant to Anna Mikusheva and Victor Chernozhukov	Fall 2011
RELEVANT POSITIONS	Research Assistant to Anna Mikusheva, MIT	2010
	Research Assistant to James Poterba, MIT	2009-10
	Summer Research Intern, Federal Reserve Bank of Chicago	2008
	Summer Intern, Ellington Management Group	2007
	Research Assistant to Nicholas Barberis, Yale	2007
FELLOWSHIPS, HONORS, AND AWARDS	National Science Foundation Graduate Research Fellowship	2011-14
	Ford Foundation Predoctoral Fellowship	2010-11
	MIT Economics Departmental Fellowship	2009-11
	Summa Cum Laude, Yale	2009
	Afro-American Cultural Center at Yale, Excellence Award	2009
	Phi Beta Kappa, Yale	2008
	Richard U. Light Fellowship, Yale	2006
	National Merit Scholarship	2005

PROFESSIONAL ACTIVITIES

Presentations: NBER Summer Institute (2013), Econometric Society North American Winter Meeting (2012), (2013), Canadian Econometrics Study Group (2011)

Referee for *Applied Econometrics, Econometrica, Journal of Public Economics, Review of Economics and Statistics*

RESEARCH PAPERS

"Conditional Linear Combination Tests for Weakly Identified Models" (Job Market Paper)

This paper constructs powerful tests applicable in a wide range of weakly identified contexts, including linear instrumental variables and nonlinear generalized method of moments (GMM) models. Our approach proceeds in two steps. First, we introduce the class of conditional linear combination tests, which reject the null hypothesis when a data-dependent convex combination of two identification-robust statistics is large. These tests control size under weak identification and are admissible, locally most powerful, and weighted average power maximizing in a conditional testing problem. In instrumental variables models with one endogenous regressor the conditional likelihood ratio test of Moreira (2003) is a conditional linear combination test, and in general models the class of conditional linear combination tests is equivalent to a class of quasi-conditional likelihood ratio tests. Second, we suggest using minimax regret conditional linear combination tests and propose a computationally tractable class of tests that plug in an estimator for a nuisance parameter. These plug-in tests offer substantially higher power than alternative approaches, matching the near-optimal performance of the conditional likelihood ratio test in homoskedastic weak instrumental variables models and substantially out-performing alternative procedures in a non-homoskedastic weak instrumental variables model and a non-linear new Keynesian Phillips curve model. These tests have optimal power in many strongly identified models, and so allow powerful identification-robust inference in a wide range of linear and non-linear models without sacrificing efficiency if identification is strong.

RESEARCH PAPERS (CONTINUED)

"Robust Two-Step Confidence Sets, and the Trouble with the First Stage F-Statistic"
When weak identification is a concern researchers frequently calculate confidence sets in two steps, first assessing the strength of identification and then, on the basis of this initial assessment, deciding whether to use an identification-robust confidence set. Unfortunately, two-step procedures of this sort can generate highly misleading confidence sets, and we demonstrate that two-step confidence sets based on the first stage F-statistic can have extremely poor coverage in linear instrumental variables models with heteroskedastic errors. To remedy this issue, we introduce a simple approach to detecting weak identification and constructing two-step confidence sets which we show controls coverage distortions under weak identification in general nonlinear GMM models, while also indicating strong identification with probability tending to one if the model is well-identified. Applying our approach to linear IV we show that it is competitive with approaches based on the first-stage F-statistic under homoskedasticity but performs far better under heteroskedasticity.

"A Geometric Approach to Weakly Identified Econometric Models" (with Anna Mikusheva)
Many nonlinear Econometric models show evidence of weak identification. In this paper we consider minimum distance statistics and show that in a broad class of models the problem of testing under weak identification is closely related to the problem of testing a ``curved null'' in a finite-sample Gaussian model. Using the curvature of the model, we develop new finite-sample bounds on the distribution of minimum-distance statistics, which we show can be used to detect weak identification and to construct tests robust to weak identification. We apply our new method to new Keynesian Phillips curve and DSGE examples and show that it provides a significant improvement over existing approaches.

"Maximum Likelihood Inference in Weakly Identified DSGE Models" (with Anna Mikusheva. Revision submitted, *Quantitative Economics*)
This paper examines the issue of weak identification in maximum likelihood, motivated by problems with estimation and inference in a multi-dimensional DSGE model. We show that two forms of the classical score (Lagrange Multiplier) test for a simple hypothesis concerning the full parameter vector are robust to weak identification. We also suggest a test for a composite hypothesis regarding a sub-vector of parameters. The suggested subset test is shown to be asymptotically exact when the nuisance parameter is strongly identified, and in some cases when the nuisance parameter is weakly identified. We pay particular attention to the question of how to estimate Fisher information, and make extensive use of martingale theory.

"A Mean Likelihood Ratio Specification Test" (Revision requested, *Journal of Econometrics*)
This paper considers the problem of specification testing in general parametric models and shows that for a wide class of models the hypothesis of correct specification is equivalent to a continuum of moment equalities. Using these

RESEARCH PAPERS (CONTINUED)

moment equalities we construct a class of specification tests that have correct asymptotic size in general parametric models, including stationary time series models, and that are consistent when the above equivalence holds. We show that the proposed tests have power against local alternatives and compare them to previously proposed consistent tests of distributional specification, both from a theoretical perspective and in simulation.

"Sufficient Statistics for Optimal Social Insurance with Heterogeneity" (with Conrad Miller)

We analyze the effect of heterogeneity on the widely used analyses of Baily 1978) and Chetty (2006) for optimal social insurance. The basic Baily-Chetty formula is robust to heterogeneity along many dimensions but requires that risk aversion be homogeneous. We extend the Baily-Chetty framework to allow for arbitrary heterogeneity across agents, particularly in risk preferences. We find that heterogeneity in risk aversion affects welfare analysis through the covariance of risk aversion and consumption drops, which measures the extent to which larger risks are borne by more risk tolerant workers. Calibrations suggest that this covariance effect may be large.

"The Allocation of Future Business: Dynamic Relational Contracts with Multiple Agents" (with Daniel Barron)

Consider a repeated moral hazard problem involving a principal and several agents. If formal contracts are unavailable and agents observe only their own relationships, an optimal relational contract allocates business among agents depending on past performance. If first-best is attainable, the principal favors an agent who performs well with future business, even if he later performs poorly. The agent loses favor only if he cannot produce and a replacement performs well. If first-best is unattainable, some relationships may deteriorate into persistent low effort. In the first best, the principal need not conceal information from agents; otherwise, she optimally conceals information.

RESEARCH IN PROGRESS

"Conditional Linear Combination Tests for Composite Hypotheses"

Chaudhuri and Zivot (2011) propose identification-robust test statistics for hypotheses with weakly identified nuisance parameters. In this project we build on the analysis of Andrews (2013) ("Conditional Linear Combination Tests for Weakly Identified Models") to study the problem of constructing powerful tests based on these statistics. Extending the class of conditional linear combination tests to this context, we develop a novel class of robust tests for hypotheses with weakly identified nuisance parameters.