Alexandre Belloni

Duke University	http://www.duke.edu/∼abn5/
Fuqua Business School	e-mail: abn5@duke.edu
PO Box 90120	phone: (919) 660-3791
100 Fuqua Drive, Office W312	fax: (919) 681-6246
Durham, NC, 27708-0120	Last updated December 8, 2011

Research Interests

Econometrics and statistics, mechanism design, probabilistic methods, mathematical optimization, complexity theory, and applications to economics, management science, marketing and engineering.

Education

Massachusetts Institute of Technology, Cambridge, MA.
PhD in Operations Research, June 2006.

Institute for Pure and Applied Mathematics, Rio de Janeiro, Brazil.
MS in Mathematical Economics, June 2002.

Pontifical Catholic University, Rio de Janeiro, Brazil.
BS in Electrical Engineering, December 1999.

Honors and Awards

2007 Young Researchers Competition in Continuous Optimization (First Prize)

2006-2007 IBM Herman Goldstine Postdoctoral Fellowship

INFORMS 2006 George Nicholson Student Paper Award (Second Prize)

IBM PhD Fellowship (2005-2006)

2005 Argonne-Chicago Institute of Computational Economics Fellowship

SIAM Student Travel Award (2005)

INFORMS 2004 Doctoral Colloquium

MIT Presidential Fellowship (2002-2003)

SIAM Student Travel Award (2002)

CEPEL Research Fellowship (2000-2002)

CNPq Fellowship (2000-2002)

IBM Academic Fellowship (1999)

IBM Academic Fellowship (1998)

Academic Honor (1996-1997)

Professional Experience

2011 - present	**Duke University, Fuqua Business School**, Durham, NC Associate Professor of Decision Sciences
2007 - 2011	**Duke University, Fuqua Business School**, Durham, NC Assistant Professor of Decision Sciences
2011 January	**MIT, Department of Economics**, Cambridge, MA Visiting Scholar
2010 May	**IMPA**, Rio de Janeiro, Brazil Visiting Scholar
2010 January	**MIT, Department of Economics**, Cambridge, MA Visiting Scholar
2009 January	**IMPA**, Rio de Janeiro, Brazil Visiting Scholar
2006 - 2007	**IBM T. J. Watson Research Center**, Yorktown Heights, NY Herman Goldstine Post-Doctoral Fellow under supervision of Jon Lee
2006 - 2007	**MIT Sloan School of Management**, Cambridge, MA Post-Doctoral Fellow under supervision of Robert M. Freund and Victor Chernozhukov
Summer 2006	**MIT Sloan School of Management**, Cambridge, MA Post-Doctoral Associate under supervision of Robert M. Freund and Victor Chernozhukov
Fall 2005	**IBM T. J. Watson Research Center**, Yorktown Heights, NY Co-op under supervision of Katya Scheinberg
2004 - 2006	**MIT Department of Economics**, Cambridge, MA Research Assistant under supervision of Victor Chernozhukov
2002 - 2006	**MIT Sloan School of Management**, Cambridge, MA Research Assistant under supervision of Robert M. Freund
2000 - 2002	**CEPEL - Electrical Energy Research Center**, Rio de Janeiro, Brazil Research Assistant under supervision of Claudia Sagastizábal

Teaching Experience

Fall 2010	Fuqua School of Business, Durham, NC Instructor for DEC311: Probability and Statistics (MBA Daytime, 3 sections).
Fall 2009	Fuqua School of Business, Durham, NC Instructor for DEC311: Probability and Statistics (MBA Daytime, 3 sections).
January 2009	IMPA, Rio de Janeiro, Brazil Instructor: Concentration Inequalities and High-dimension Estimation (mini-course).
Fall 2008	Fuqua School of Business, Durham, NC Instructor for DEC311: Probability and Statistics (MBA Daytime, 3 sections).
Fall 2007	Fuqua School of Business, Durham, NC Instructor for DEC311: Probability and Statistics (MBA Daytime, 3 sections).

Winter 2005	Massachusetts Institute of Technology, Cambridge, MA Instructor for IAP course Bundle Methods for Non-Smooth Optimization.
Spring 2004	Massachusetts Institute of Technology, Cambridge, MA Teaching Assistant for 15.094 Systems Optimization: Models and Computation.
Fall 2003	Massachusetts Institute of Technology, Cambridge, MA Teaching Assistant for 15.099 Readings in Optimization: Probabilistic Methods for Continuous Deterministic Optimization Problems.

Grants Funded

Applied Mechanism Design, with G. Lopomo, L. Marx, and P. Sun. (NSF)

Submitted Papers

1. Conditional Quantile Processes based on Series or Many Regressors, with Victor Chernozhukov and Iván Fernández-Vál
2. Approximate group context tree: applications to dynamic programming and dynamic choice models, with Roberto I. Oliveria
3. Estimation and Inference Methods for High-Dimensional Sparse Econometric Models, with Victor Chernozhukov and Chris Hansen
4. Does Private Information about Inventories Matter?, with Giuseppe Lopomo and Shouqiang Wang
5. Sparse Models and Methods for Optimal Instruments with an Application to Eminent Domain, with Daniel Chen, Victor Chernozhukov and Chris Hansen
6. LASSO Methods for Gaussian Instrumental Variables Models, with Victor Chernozhukov and Chris Hansen
7. Optimal Admission and Scholarship Decisions: Choosing Customized Marketing Offers to Attract a Desirable Mix of Customers, with William Boulding, Richard Staelin, and Mitchell Lovett

Publications

8. Least Squares After Model Selection in High-dimensional Sparse Models with Victor Chernozhukov (accepted at Bernoulli, former title:"Post-ℓ_1-penalized estimators in high-dimensional linear regression models").
9. Square-root LASSO: Pivotal Recovery of Sparse Signals via Conic Programming with Victor Chernozhukov and Lie Wang (accepted at Biometrika, 2011).
10. On Multivariate Quantiles under Partial Ordering, with Robert L. Winkler (Annals of Statistics, Volume 39, Number 2 (2011), 1125-1179).
11. ℓ_1-Penalized Quantile Regression in High-Dimensional Sparse Models, with Victor Chernozhukov (Annals of Statistics, Volume 39, Number 1 (2011), 82-130).
12. High-Dimensional Sparse Econometric Models, an Introduction, with Victor Chernozhukov, Inverse Problems and High-Dimensional Estimation, Springer Lecture Notes in Statistics, 2011, pp. 121-156.
13. Multi-dimensional Mechanism Design: Finite Dimensional Approximations and Efficient Computation, with Giuseppe Lopomo and Shouqiang Wang (Operations Research, Volume 58 Issue 4-Part-2, 2010, pp. 1079-1089).
14. An Efficient Re-scaled Perceptron Algorithm for Conic Systems, with Robert M. Freund and Santosh Vempala (Mathematics of Operations Research, Vol. 34, No. 3, August 2009, pp. 621–641).

15. On the Computational Complexity of MCMC-based Estimators in Large Samples, with Victor Chernozhukov (Annals of Statistics 2009, Vol. 37, No. 4, pp. 2011-2055).

16. On the Behrens-Fisher problem: a globally convergent algorithm and a finite-sample study of the Wald, LR, and LM tests, with Gustavo Didier (Annals of Statistics, 2008, Vol. 36, No. 5, pp. 2377-2408).

17. On the Second-Order Feasibility Cone: Primal-Dual Representation and Efficient Projection, with Robert M. Freund (SIAM Journal on Optimization, Volume 19, Issue 3, pp. 1073–1092, 2008).

18. Optimal Product Line Design: Efficient Methods and Comparisons, with Robert M. Freund, Matthew Selove, and Duncan Simester (Management Science Vol. 54, No. 9, September 2008, pp. 1544–1552).

19. Dynamic Bundle Methods, with Claudia Sagastizábal (Mathematical Programming, Volume 120, Number 2 / September, 2009, pp. 289–311; former title:"Dynamic Bundle Methods: Application to Combinatorial Optimization").

20. A Geometric View of Renegar's Condition Number, with Robert M. Freund (Mathematical Programming, Volume 119, Issue 1 (2009), pp. 95–107).

21. Norm-Induced Densities and Testing the Boundedness of a Convex Set (Mathematics of Operation Research, Vol. 33, No. 1, February 2008, pp. 235-256)

22. Projective re-normalization for improving the behavior of a homogeneous conic linear system, with Robert M. Freund (Mathematical Programming 118, pp. 279-299, 2009).

23. On the Symmetry Function of a Convex Set, with Robert M. Freund (Mathematical Programming, Volume 111, Numbers 1-2 / January, 2008, pp. 57–93).

24. Studies Integrating Geometry, Probability, and Optimization under Convexity. PhD Thesis Massachusetts Institute of Technology, 2006.

25. Lagrangian Based Heuristic for the Linear Ordering Problem, with Abílio Lucena. In Metaheuristics Computer Decision Making, edited by M. G. C. Resende and J. P. de Sousa with the assistance of A. Viana, Kluwer Academic Publishers, 2004, pp. 37–64.

26. Bundle Relaxation and Primal Recovery of Unit Commitment Problems. The Brazilian Case, with André Diniz, Maria E. P. Maceira and Claudia Sagastizábal. Annals of Operation Research, 120, pp. 21-44, 2003.

Technical Reports

27. Introduction to Bundle Methods. MIT IAP, 2005.

28. Computing Decision under Potentially Adaptive Uncertainty Aversion: Application to Power Systems, with Aloisio Araujo. PSR Technical Report, 2010.

Presentations

1. "Approximate Group Context Tree: applications to dynamic programming and dynamic choice models," invited seminar at USC, Business School, December 2011.

2. "On model selection and high-dimensional sparse models in Econometrics," invited seminar at North Carolina State University, Department of Economics, November 2011.

3. "Approximate Group Context Tree: applications to dynamic programming and dynamic choice models," invited talk INFORMS 2011.

4. "Pivotal Estimation of Nonparametric Functions via Conic Programming," invited talk INFORMS 2011.

5. High dimensional Sparse Econometric Models, An Introduction, ICE 2011, Booth School of Business, University of Chicago.

6. Model Selection and High-Dimensional Sparse Econometric Models, Invited Talk at Northwestern University, Department of Economics, May 2011.

7. Sparse Models and Methods for Optimal Instruments with an Application to Eminent Domain, 2010 Triangle Econometrics Conference, NISS, December 2010.

8. On Multivariate Quantiles under Partial Ordering, MIT/Harvard Econometric Workshop, November, 2010.

9. On Multivariate Quantiles under Partial Ordering, Decision Science Seminar at Fuqua School of Business, November, 2010.

10. High-Dimensional Sparse Econometric Models, Summer Seminar Series at Fuqua School of Business, June, 2010.

11. Penalized Quantile Regression in Sparse High-dimensional Models, with Victor Chernozhukov, Invited Talk at IMPA, June, 2010.

12. Multi-dimensional Mechanism Design: Finite Dimensional Approximations and Efficient Computation, with G. Lopomo, S. Wang, invited talk at Booth Chicago School of Business, 2010.

13. Multi-dimensional Mechanism Design: Finite Dimensional Approximations and Efficient Computation, with G. Lopomo, S. Wang, STOR seminar at UNC, 2009.

14. Multi-dimensional Mechanism Design: Finite Dimensional Approximations and Efficient Computation, with G. Lopomo, S. Wang, ISMP at Chicago, 2009.

15. Penalized Quantile Regression in Sparse High-dimensional Models, with Victor Chernozhukov, Invited Talk at London Business School, June, 2009.

16. Penalized Quantile Regression in Sparse High-dimensional Models, with Victor Chernozhukov, CEMMAP at UCL, June, 2009.

17. Penalized Quantile Regression in Sparse High-dimensional Models, with Victor Chernozhukov, Invited Talk at PUC-rio, January, 2009.

18. Penalized Quantile Regression in Sparse High-dimensional Models, with Victor Chernozhukov, 2008 Triangle Econometrics Conference, NISS, December, 2008.

19. Penalized Quantile Regression in Sparse High-dimensional Models, with Victor Chernozhukov, Latin American Meeting of the Econometric Society, Rio de Janeiro, November, 2008.

20. On the Behrens-Fisher problem: a globally convergent algorithm and a finite-sample study of the Wald, LR, and LM tests, with Gustavo Didier, SIAM Meeting on Optimization, Boston, May, 2008.

21. Conditional Quantile Processes under Increasing Dimension, with Victor Chernozhukov. NAWM Econometric Society, New Orleans, January, 2008.

22. An Integer Stochastic Programming Problem with Linear Fractional Objective Function, 2007 INFORMS, Seattle, November, 2007.

23. Conditional Quantile Processes under Increasing Dimension, with Victor Chernozhukov. 2007 INFORMS, Seattle, November, 2007.

24. Norm-induced densities and testing the boundedness of a convex set. International Conference on Continuous Optimization (ICCOPT), Hamilton, Canada, August, 2007.

25. Efficiency of a Re-scaled Perceptron Algorithm for Conic Systems, with Robert M. Freund and Santosh Vempala. International Conference on Continuous Optimization (ICCOPT), Hamilton, Canada, August, 2007.

26. On the Computational Complexity of MCMC-Based Estimators under Large Samples, with Victor Chernozhukov. 2007 North American Summer Meeting of the Econometric Society, Durham NC, June 2007.

27. Efficiency of a Re-scaled Perceptron Algorithm for Conic Systems, with Robert M. Freund and Santosh Vempala. COLT, San Diego, June, 2007.

28. Projective Pre-conditioners for Improving the Practical Performance of IPMs for Conic Programming, with Robert M. Freund. INFORMS 2006, Pittsburg PA, November 2006.

29. On the Computational Complexity of MCMC-Based Estimators under Large Samples, with Victor Chernozhukov. George Nicholson Student Paper Competition, INFORMS 2006, Pittsburg PA, November 2006.

30. Efficiency of a Re-scaled Perceptron Algorithm for Conic Systems, with Robert M. Freund and Santosh Vempala. IBM T. J. Watson Research Center, AP/IP Seminar Series, September, 2006.

31. Testing the Boundedness of a Convex Set, 19th International Symposium on Mathematical Programming, Rio de Janeiro, Brazil, August 2006.

32. Two Applications of High-Dimensional Random Sampling for Convex Problems. McMaster University, Canada, February 2006.

33. Computational Complexity of MCMC-Based Estimators under the Central Limit Theorem Framework, with Victor Chernozhukov. New York University, Stern School of Business, Operations Management, NY, February 2006.

34. Two Applications of High-Dimensional Random Sampling. Duke University, Fuqua School of Business, Decision Science, NC, February 2006.

35. Optimizing Product Line Design: Efficient Methods and Comparisons, with Robert Freund, Matthew Selove and Duncan Simester. University of British Columbia, Sauder School of Business, Operations and Logistics, Canada, February 2006.

36. Computational Complexity of MCMC-Based Estimators under the Central Limit Theorem Framework, with Victor Chernozhukov. Columbia University, Graduate School of Business, Decision, Risk and Operations, NY, February 2006.

37. Optimizing Product Line Design: Efficient Methods and Comparisons, with Robert Freund, Matthew Selove and Duncan Simester. Columbia University, Graduate School of Business Decision, Risk and Operations, NY, February 2006.

38. Projective Pre-conditioners for Solving Homogeneous Linear Conic Systems, with Robert M. Freund. University of Waterloo, Department of Combinatorics and Optimization, Canada, January 2006.

39. Two (or Three) Applications of High-Dimensional Random Sampling for Convex Problems. IBM T. J. Watson Research Center, NY, December 2005.

40. Projective Pre-conditioners for Improving the Behavior of Homogeneous Conic Systems, with Robert Freund. INFORMS 2005, San Francisco, November 2005.

41. Randomized methods for (continuous) deterministic optimization and associated complexity analysis, with Robert Freund. Foundations of Computational Mathematics, Santander, Spain, June 2005.

42. Projective Pre-conditioners for Improving the Behavior of Homogeneous Conic Systems, with Robert Freund. SIAM Conference on Optimization, Stockholm, Sweden, May 2005.

43. Projective Pre-conditioners for Improving the Behavior of Homogeneous Conic Systems, with Robert Freund. (Invited Speaker) IMPA, Rio de Janeiro, Brazil, February 2005.

44. Projective Pre-conditioners for Improving the Behavior of Homogeneous Conic Systems, with Robert Freund. (Invited Speaker) IBM T. J. Watson Research Center, NY, January 2005.

45. Probabilistic Methods for Solving Homogeneous Conic Convex Systems, with Robert Freund. Oberwolfach, Germany, January 2005.

46. Symmetry Function and Symmetry Points of a Convex Sets: Properties, Duality and Complexity, with Robert Freund. Workshop on Large Scale Nonlinear and Semidefinite Programming, University of Waterloo, Waterloo, Ontario 2004.

47. Symmetry Points of Convex Sets: Basic Properties and Complexity, with Robert Freund. V Brazilian Workshop on Continuous Optimization 2004, Brazil.

48. Méthodes de faisceaux appliqquées l'opitimisation combinatorie, with Claudia Sagastizábal. SYDOCO 2002, INRIA, France.

49. Uncertainty Aversion Applied to the Power Systems, with Aloisio Araujo. IV Brazilian Workshop on Continuous Optimization 2002, Brazil.

50. Bundle Relaxation and Primal Recovery in Unit Commitment Problems. The Brazilian Case, with C. Sagastizábal, A. Diniz, M. E. Maceira, L. C. Sousa, F. Costa and L. Terry. IV Brazilian Workshop on Continuous Optimization 2002, Brazil.

51. Dynamic bundle methods for combinatorial optimization, with Claudia Sagastizábal. IV Brazilian Workshop on Continuous Optimization 2002, Brazil.

52. Dynamic Bundle Methods for Combinatorial Optimization, with Claudia Sagastizábal. SIAM Conference on Optimization 2002, Toronto, Canada.

53. Lagrangian Heuristics for the Linear Ordering Problem, with Abílio Lucena. 4th Metaheuristic Conference 2001, Portugal.

54. Relax and Cut, with Claudia Sagastizábal. III Brazilian Workshop on Continuous Optimization, 2001.

55. Relax and Cut Algorithm for the Traveling Salesman Problem, with Abílio Lucena. 17th International Symposium on Mathematical Programming, Atlanta, USA, 2000.

Professional Activities

Referee for Econometrica, JASA, Journal of Econometrics, Management Science, Mathematical Programming, Mathematics of Operations Research, Operations Research, Journal of Machine Learning Research, 4OR, Optimization Methods and Software.
Member of INFORMS since 2002. Member of SIAM since 2003.

Extracurricular Activities

Field hockey (member of the Brazilian national team since 1998, and member of the Boston team during 2002-2007).

Computer Skills and Interests

FORTRAN, C and C++ programming languages; MATLAB, AMPL, and R.

Citizenship Citizen of Brazil. Permanent Resident of US (green card).