



HIGH-DIMENSIONAL ECONOMETRICS:

ORACLE PROPERTY, ORACLE INEQUALITIES AND INFERENCE

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Thursday-Friday 19-20 March

Building 2610, room 514 (S)

13:00 – 16:00 Lecture 1-2

Monday-Tuesday 23-24 March

Building 2610, room 530 (S)

13:00 – 16:00 Lecture 3-4

High-dimensional econometrics: oracle property, oracle inequalities and inference

Anders Bredahl Kock

Time

March 19-20 and March 23-24, 2015.

Philosophy

All lectures begin with an overview and main ideas. We show how to implement the methods in R. Then we proceed to proofs – this part is not mandatory.

Course description

- Lecture 1 (March 19, 3 hours): Introduction, What are high-dimensional models, Lasso, Exact zeros, Bühlmann and van de Geer (2011), Asymptotics, Knight and Fu (2000). Illustration in R. How to implement the Lasso (this is very simple!)
- Lecture 2 (March 20, 3 hours): Oracle property: Illustrate by adaptive Lasso, Zou (2006), Variable selection by thresholding, the importance of ℓ_∞ -bounds in high dimensions. Illustration in R.
- Lecture 3 (March 23, 3 hours): Oracle inequalities: Bickel et al. (2009). Finite sample bounds vs. asymptotic theory. Other data types than i.i.d – VAR as example Kock and Callot (2012).
- Lecture 4: (March 24, 3 hours) Inference in high-dimensional models: How to test hypotheses, uniform (honest) inference. van de Geer et al. (2014). Caner and Kock (2014). Linear programming methods a la Javanmard and Montanari (2014). Double post selection a la Belloni et al. (2012, 2014); Chernozhukov et al. (2015)

References

- Belloni, A., D. Chen, V. Chernozhukov, and C. Hansen (2012). Sparse models and methods for optimal instruments with an application to eminent domain. *Econometrica* 80(6), 2369–2429.
- Belloni, A., V. Chernozhukov, and C. Hansen (2014). Inference on treatment effects after selection among high-dimensional controls. *The Review of Economic Studies* 81(2), 608–650.
- Bickel, P. J., Y. Ritov, and A. B. Tsybakov (2009). Simultaneous analysis of lasso and dantzig selector. *The Annals of Statistics*, 1705–1732.
- Bühlmann, P. and S. van de Geer (2011). *Statistics for high-dimensional data: methods, theory and applications*. Springer Science & Business Media.
- Caner, M. and A. B. Kock (2014). Asymptotically honest confidence regions for high dimensional parameters by the desparsified conservative lasso. *arXiv preprint arXiv:1410.4208*.
- Chernozhukov, V., C. Hansen, and M. Spindler (2015). Valid post-selection and post-regularization inference: An elementary, general approach. *arXiv preprint arXiv:1501.03430*.
- Javanmard, A. and A. Montanari (2014). Confidence intervals and hypothesis testing for high-dimensional regression. *The Journal of Machine Learning Research* 15(1), 2869–2909.
- Knight, K. and W. Fu (2000). Asymptotics for lasso-type estimators. *Annals of Statistics*, 1356–1378.
- Kock, A. B. and L. Callot (2012). Oracle inequalities for high dimensional vector autoregressions. *Journal of Econometrics (forthcoming)*.
- van de Geer, S., P. Bühlmann, Y. Ritov, R. Dezeure, et al. (2014). On asymptotically optimal confidence regions and tests for high-dimensional models. *The Annals of Statistics* 42(3), 1166–1202.
- Zou, H. (2006). The adaptive lasso and its oracle properties. *Journal of the American Statistical Association* 101(476), 1418–1429.