Bootstrap tuning in ordered model selection

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Aim of the Paper

- Model Selection plays a crucial part in the statistics literature and becomes more important in econometrics
- Many of these model selection procedures rely on specific model assumptions and involve use of calibration constants
- Aim of the paper: Develop a unified approach to the problem of ordered model selection

Main Results

- The authors consider the model

$$Y_i = \Psi_i^{\perp} \theta^* + \varepsilon_i \tag{1}$$

  for a design $n \times p$ design matrix Ψ_i. But also allow for misspecification.

- Estimate θ^* for instance by projection estimation on an m–dimensional space

- How to choose the dimension parameter m?
  $\Rightarrow$ SmA-Procedure: based on family of pairwise tests, each model is tested against all larger ones.

- When noise is unkown: Authors propose sharp bounds for a bootstrap procedure

Can we link the method to econometrics?

- Consider the instrumental variable model

$$Y = \Psi(X)^{\perp}\theta^{*} + U \quad E(U|W) = 0$$

  where X is possibly endogenous and a vector of instruments W.
- This yields the reduced form equation

$$Y = E(\Psi(X)^{\perp}|W)\theta^{*} + \varepsilon \quad \text{where } \varepsilon = \Psi(X)^{\perp}\theta^{*} - E(Y|W) + U$$

  It holds $\mathbb{E}(\varepsilon|W) = 0$.
- Even in the ideal case, where the eigenfunctions of the conditional expectation operator are known, eigenvalues have to be estimated.
- Can your approach be generalized to inverse problems with unknown operators?