Hypothesis Testing Under Matrix Normalisation

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Abstract

It is well known that systems of regression equations and extremum estimation problems often involve variables with characteristics that do not necessarily conform to standard asymptotic theory of estimation and testing. These differences can arise from differing degrees of persistence in the variables or failures/near-failures in identification at certain points in the parameter space. To accommodate such non-conformities with standard asymptotics into a framework for inference, sample moments typically require matrix-valued normalisations, a complication that may result in asymptotic rank deficiencies that affect both estimation and inference in regression and extremum estimation. In hypothesis testing, interaction between the matrix-valued normalisation and the matrix of restrictions imposed by the null hypothesis may lead to further degeneracies and non-standard limit theory for Wald type test statistics. The paper provides a general analysis of asymptotic theory under such non-conformities in regression variables and moment conditions, providing a canonical form for the limit distributions and giving sufficient conditions that guarantee standard chi-squared inference for Wald tests. Applications to cross section and time series econometric models with potential identification anomalies and signal strength differences are discussed.

Keywords: Degeneracy, Extremum estimation, Identification, Instrumentation, Inconsistency, Matrix normalization, Multiple conference rates, Near-unidentification, Rank deficiency. Wald test.

JEL classifications: C21, C22, C26

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