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"Robust GMM Estimation and Testing in a Weak Instrument Setting: Bridging Theory and Practice", with Marcelo Moreira and Whitney Newey.

Abstract: The continuously updating generalized method of moments (CU-GMM) estimator has appealing theoretical properties, see Newey and Windmeijer (2009). However, it lacks a closed-form expression for HAC errors and requires solving a non-convex optimization problem. In this work, we demonstrate that the objective function of the CU-GMM estimator is a ratio of polynomials. Consequently, we translate the optimization problem into finding roots for polynomial equations. Our analysis reveals the sensitivity of the CU-GMM estimator to different optimization methods, showcasing significantly reduced dispersion compared to prior literature. Next, we turn to testing. The Conditional Likelihood Ratio (CLR) test has interesting theoretical properties and, importantly, does not suffer from the criticism raised by Moreira et al. (2023). Notably, in linear IV regression, the LR statistic can also be expressed in the CU-GMM format. Therefore, we use our proposed procedure to compute the LR statistic accurately. We show that the implementation of CLR is again sensitive to optimization methods, and previous implementation deficiencies can lead to problematic size and power for the CLR test. Since current implementations do not guarantee correct test size, let alone that it is a similar test, the CLR test becomes unreliable in practice. Applying the polynomial method presented here ensures that the implementation aligns with theoretical expectations.