博士学位論文要旨

"Essays on Dynamic Panel Data Models"

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This doctoral dissertation is concerned with the bias problem of dynamic panel data models. Specifically, in Chapter 2 and 3, we discuss the bias problem of the generalized method of moments (GMM) estimator in dynamic panel data models when both N and T tend to infinity, where N and T are the sample size of cross section and time series. In Chapter 4 and 5, we discuss the bias problem of the OLS based estimators of dynamic panel data models with cross-section dependence and heteroskedasticity, and dynamic panel data models with constant and time trend fixed effects.

The construction of the dissertation is as follows:

Chapter 1: Introduction: Overview and Purpose

Chapter 2: The Asymptotic Properties of the System GMM Estimator in Dynamic Panel Data Models When Both N and T are Large

Chapter 3: Efficient GMM Estimation of Dynamic Panel Data Models Where Large Heterogeneity May Be Present

Chapter 4: Reevaluation of the Bias-Corrected First-Difference Estimator in AR(1) Dynamic Panel Data Models

Chapter 5: New Transformation Methods in Dynamic Panel Data Models with Heterogeneous Time Trends

We now provide a brief description of each chapter.

In Chapter 1, we briefly review the literature and state the purpose of the dissertation. First, we provide a simple explanation of the estimators discussed in this dissertation, i.e. the bias-corrected within-groups (WG) estimators, the bias-corrected first-difference estimator, and the GMM estimators, and then state the purpose of the dissertation.

In Chapter 2, we derive the asymptotic properties of the system GMM estimator by Blundell and Bond (1998) under large-N and large-T asymptotics for AR(1) panel data models. Although Alvarez and Arellano (2003) showed the asymptotic properties of the first-difference GMM estimator by Arellano and Bond (1991), they did not show the result for the system GMM estimator in spite of its wide use in empirical analysis. The purpose of this chapter is to derive the asymptotic properties of the system GMM estimator under large-N and large-T asymptotics. In fact, we derive the asymptotic properties of the level GMM estimator by Arellano and Bover (1995), and then combine two results to obtain the result for the system GMM estimator. As a result, we find that the system GMM estimator with the instruments which Blundell and Bond (1998) used will be inconsistent when both N and T are large. We also show that the system GMM estimator with all available instruments, including redundant ones, will be consistent if $\sigma_\eta^2/\sigma_v^2 = 1 - \alpha$ holds, where σ_η^2 and σ_v^2 are the variances of individual effects and disturbances respectively, and α is the autoregressive parameter.

In Chapter 3, we address the many instruments problem, i.e. (1) the trade-off between the bias and the efficiency of the GMM estimator, and (2) inaccuracy of inference, in dynamic panel data models where unobservable heterogeneity may be large.[1] To address this problem, we propose a new form of instruments that

[1] We say "heterogeneity is large" when the variance of individual effects is much larger than that of disturbances.

are obtained from the so-called backward orthogonal deviation transformation. The asymptotic analysis shows that the GMM estimator with the reduced number of new instruments has smaller asymptotic bias than the estimators typically used such as the GMM estimator with all instruments in levels, the LIML estimators and the within-groups estimators, while the asymptotic variance of the proposed estimator is equal to the lower bound. Thus *both* the asymptotic bias and the variance of the proposed estimators become small simultaneously. Simulation results show that our new GMM estimator outperforms the conventional GMM estimator with all instruments in levels in term of the bias, RMSE, and accuracy of inference.

In Chapter 4, we reevaluate the bias-corrected first-difference estimator in AR(1) dynamic panel data models, which was proposed by Chowdhury (1987) and reconsidered by Ramalho (2005) and Han and Phillips (2007). In the first section, we propose a test to detect a hypothesis of no individual effects in the model based on Hausman test. We show that Hausman test based on the bias-corrected first-difference estimator performs better than Hausman tests based on the bias-corrected estimator by Bun and Carree (2005) and the GMM estimator. In the second section, we show that the bias-corrected first-difference estimator can be applied to dynamic panel data models with cross-section dependence and heteroskedasticity. By deriving the finite sample bias of order $O(T^{-1})$, we find that the bias-corrected first-difference estimator has smaller bias than the existing estimator especially when the autoregressive parameter is close to one. The simulation result shows that the bias-corrected first-difference estimator performs better than the bias-corrected estimator by Phillips and Sul (2007) especially when T is moderately large, the autoregressive parameter is close to one, and there is a heteroskedasticity.

In Chapter 5, we propose two new transformation methods which eliminate both constant and time trend fixed effects jointly. In the literature, there are two typical transformation methods which possess this property, i.e. (1) a within-groups transformation which is modified so as to eliminate constant and trend fixed effects, and (2) taking a second difference. However, pooled OLS estimators after these two transformations have large bias when T is not so large. The purpose of this chapter is to propose new transformation methods which have smaller biases than the existing methods. Specifically, we propose two new transformation methods so called *double* within-groups and *long* within-groups transformations. The theoretical and numerical analysis show that pooled OLS estimators after the new transformations have smaller biases than those of the conventional estimators which are used in the literature.

Reference

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