

Kernel Estimation for Panel Data with Heterogeneous Dynamics

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Abstract

This paper proposes nonparametric kernel-smoothing estimation for panel data to examine the degree of heterogeneity across cross-sectional units. Our procedure is model-free and easy to implement, and provides useful visual information, which enables us to understand intuitively the properties of heterogeneity. We first estimate the sample mean, autocovariances, and autocorrelations for each unit and then apply kernel smoothing to compute estimates of their density and cumulative distribution functions. The kernel estimators are consistent and asymptotically normal under double asymptotics, i.e., when both cross-sectional and time series sample sizes tend to infinity. However, as these exhibit biases given the incidental parameter problem and the nonlinearity of the kernel function, we propose jackknife methods to alleviate any bias. We also develop bandwidth selection methods and bootstrap inferences based on the asymptotic properties. We illustrate the success of our procedure using an empirical application of the dynamics of US prices and Monte Carlo simulation. We also develop an R package to implement the proposed procedure, which is available via the authors' webpages.

Keywords: panel data, heterogeneity, autocorrelation structure, nonparametric kernel smoothing, jackknife, bootstrap.

JEL Classification: C13, C14, C23.

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