Binarization for Panel Models with Fixed Effects

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Preliminary. Comments welcome.

Abstract

Nonlinear panel models with fixed effects and fixed$-T$ are subject to the incidental parameter problem. This poses identification difficulties for both structural parameters and partial effects. We analyze a fixed effects linear transformation model (FELT), where the transformation function is unknown, time-varying, and weakly monotone. FELT accommodates both continuous and discrete outcomes, and both nests and extends many panel models that are heavily used in applied work. We present new identification results for this large class of models. First, we provide a systematic solution to the incidental parameter problem without imposing any parametric distributional assumptions. Second, we show that identification of the structural function is sufficient for the identification of a menu of partial effects that are time-varying in an unrestricted way. Two time periods are sufficient for our results. We obtain our results via *binarization*. We show that binarization may be of independent interest by further applying it to both a nonlinear fixed effects panel model with random coefficients and a nonlinear difference-in-differences model. We propose estimators and analyze their large sample properties.

Keywords: panel data, fixed effects, time-varying transformation model, partial effects, incidental parameter, random coefficients.
JEL classification: C14; C23; C41

1 Introduction

Panel models used in microeconometrics include individual-specific parameters, or *fixed effects,* in order to capture individual-specific unobservables that may be correlated with the regressors. If the number of observations per individual is small, then two problems arise in nonlinear panel models. First, common parameters may fail to be point-identified, which is known as the *incidental parameter problem*. Second, even when the common parameters can be identified, interesting partial effects may not be.

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