

Forecasting with a Panel Tobit Model by Liu, Moon and Schorfheide – Discussion

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Motivation

- ▶ Many data sets are of the form: many individuals / units are observed, but only few observations per individual. “short panel data”
- ▶ Examples
 - ▶ Customer data sets of tech / web companies: many customers, but only very few observations per individual.
 - ▶ Here: loan charge-off rates of banks.
- ▶ Goal: prediction of (non-linear) panel data
- ▶ Very important and challenging problem

- ▶ Here: Bayesian approach for specifying individual specific effects (random effects) and focusing on Tobit model
- ▶ For a frequentist approach: cf our poster :-)

Example

$$Y_{it} = \lambda_i + U_{it}, U_{it} \sim N(0, 1), t = 1, \dots, T, \quad i = 1, \dots, N.$$

- ▶ Goal: forecasting Y_{iT+1}
- ▶ Estimate of $\hat{\lambda}_i$ is required: $\hat{Y}_{iT+1|T} = \hat{\lambda}_i$
- ▶ Naive estimate: $\hat{\lambda}_i = 1/T \sum_{t=1}^T Y_{it}$
- ▶ Fully Bayesian Estimation: specification of prior distribution $\pi(\lambda)$ with hyperparameters (ζ) (hierarchical Bayes)
- ▶ Research agenda “Forecasting with Dynamic Panel Data Models” (Liu, Moon and Schorfheide)
- ▶ Here: Focus on Panel Tobit Model

Panel Tobit Model

$$y_{it} = y_{it}^* \mathbf{1}\{y_{it}^* \geq 0\}, i = 1, \dots, N, \quad t = 0, \dots, T$$

$$y_{it}^* = \lambda_i + \rho y_{it}^* + u_{it}, u_{it} \sim N(0, \sigma^2), \text{ iid}, y_{i0}^* \sim N(\mu_{i*}, \sigma_*^2)$$

$$\lambda_i \sim \pi(\lambda) \text{ iid}$$

- ▶ Estimation / prediction by simulation
- ▶ Computational complexity / time? Scalability?

Application

- ▶ Loan charge-off rates: amount of defaulted loans in comparison to the total amount of all loans in a certain period.
- ▶ $N = 875$, $T = 10$, 33% zeros
- ▶ Forecast period: 2004Q1
- ▶ Additional variables: house price index, unemployment rate
→ additional variables?
- ▶ Multi-step forecasts?

Extensions

- ▶ Missing at random observations
- ▶ Correlated random effects
- ▶ High-dimensional set of covariates, model selection.
- ▶ Fractional dependent data
Loudermilk, M. S. Estimation of Fractional Dependent Variables in Dynamic Panel Data Models with an Application to Firm Dividend Policy. *Journal of Business and Economic Statistics*, 25 (2007), 462–472.

Thank you for your attention!