Advanced Topics in Statistical Methods

PLSC 504

Exercise Five

November 9, 2017

Part I

The general purpose of this homework assignment is to examine differences between conditional (unit-effects) models and population-averaged (GEE) models for panel and time-series cross-sectional data. In Part I, you will do so via a simulation exercise.

The general question to be answered in this exercise is "What is the effect of fitting a unit-effect (GEE) model on data where the actual data-generating process is GEE (unit effects)?" To that end, begin with simulated balanced data on $N = 20$ units, each with $T = 5$ observations (so, $NT = 100$). Generate binary-outcome population-averaged data according to:

$$\begin{aligned} Y_{it}^{PA} &= \text{Bernoulli}[\Lambda(-1 + 2X_{it})], \\ X_{it} &= 0.6X_{it-1} + u_{it}, \\ u_{it} &\sim N(0, 1), \text{ and} \\ X_{i0} &= 0 \end{aligned}$$

that is, where temporal dependence in X leads to temporal dependence in (the binary) Y and Λ is the logit "link." Also generate binary-outcome unit-effect data of the same size, according to:

$$\begin{aligned} Y_{it}^{UE} &= \text{Bernoulli}[\Lambda(-1 + 2X_{it} + \alpha_i)], \\ X_{it} &\sim N(0, 1) \\ \alpha_i &\sim N(0, 1) \end{aligned}$$

such that any temporal dependence in Y is due entirely to the presence of a (time-constant) unit effect. Then, do the following:

1. First, fit GEE models to Y^{PA} and unit-effects (that is, fixed and/or random-effects models) to Y^{UE}, and discuss whether the models were able to adequately recover the parameter on X.

2. Second, "flip" the models, so that you are fitting GEE model(s) to the unit-effects data and unit-effects models to the population-averaged data. Note that you should estimate both fixed- and random-effects models in the latter case; in the former, consider 2-3 possible correlation structures. Discuss what you find.

3. Third, repeat the simulations in steps 1 and 2, for

   (a) data where $N = 20$ but $T = 50$, and

   (b) data where $N = 200$ and $T = 5$.

   Discuss what you find in each of these instances. In each case in steps 2 and 3, pay particular attention to how "accurately" the model(s) in question recover the underlying parameter of the data-generating process, and on explanations for the differences that you find, if any.

Part II

"Do economic sanctions destabilize country leaders?" That is the title of – and the provocative question asked in – Nikolay Marinov's (2005) article in the *American Journal of Political Science*.[1] Marinov derives a theory of economic sanctions' influence on leaders' ability to retain power, and tests that theory using annual data on all world leaders between 1919 and 2005 ($N = 210, T = 87$). His variable of interest is a binary indicator of leadership "failure," and he examines the influence of a range of covariates on that failure, including the presence of international sanctions against the country, economic wealth and growth, regime type, and leaders' age and tenure of office; see his article for details of data and coding. He estimates a conditional fixed-effects logit model with the obligatory cubic splines.

Your general assignment is to replicate Marinov's analysis, and to subject it to a sensitivity analysis regarding model type. To that end, you should, minimally:

- Replicate the model he reports in *column one of Table 2* of his article; this is the specification on which you should focus for the balance of the exercise (that is, you can ignore (e.g.) the interactions-with-sanctions models in column three),
- Assess the robustness of his findings to (at least one) alternative approach for dealing with unit-level effects, and
- Whether a population-averaged (GEE) may be more justifiable, given the data and research question. In the latter case, fit and discuss GEE models, varying the working correlation structure, and discuss any differences you find.

This assignment is due (electronically, to Zorn and Song) by 5:00 p.m. ET on Tuesday, November 28, 2017, and is worth 50 points.

[1] Available at http://www.blackwell-synergy.com/doi/pdf/10.1111/j.1540-5907.2005.00142.x