Cross-nested logit models

Estimating complex network structures

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Research question

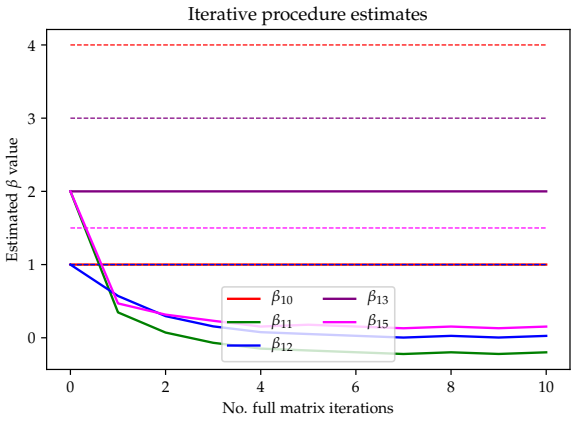
RQ:

- Show how the cross-nested logit model can extend the concepts of nested choices to a range of complex choice puzzles.
- Implement an estimator for the cross-nested logit on synthetic and real data (for the Danish unemployment benefits systems).

status

- We know how the estimator should be coded up (there are linalg related technicalities making this difficult)
- Optimizing a complex likelihood function is probably to difficult for us (but we're looking into it)

Estimation



- Clearly not correct estimates. Perhaps some kind of convergence? Depending on initial values this might look better or worse.

Current procedure:

- initiate with some parameters set to 0,1 or true value.
- for each parameter find a univariate optimum
- repeat n times over all parameters.

Out thoughts:

- The model is over-identified?
- The likelihood has a very weak global minimum $\Rightarrow$ we cannot feasibly find the correct minimum without advanced optimization?

Usability

We haven't written a lot about this so far, but we want to emphasize how complex parameter interpretation is in this framework.

- There potentially are many local minima of the likelihood function.
- The math is complex, i.e. marginal effects are

$$\frac{\partial \Pr(i|\mathcal{C})}{\partial x} = \Pr(i|\mathcal{C}) \left(\beta_i - \sum_j \left[\beta_j \Pr(j|\mathcal{C}) + \frac{e^{x\beta_j} \frac{\partial^2 G}{\partial z_j \partial x}}{\sum_{j'} e^{x\beta_{j'}} \frac{\partial G}{\partial z_{j'}}} \right] \right) + \frac{e^{x\beta_i} \frac{\partial^2 G}{\partial z_i \partial x}}{\sum_j e^{x\beta_j} \frac{\partial G}{\partial z_j}} \tag{1}$$

So all in all you **a)** need parameter estimates for interpreting and should therefore use a simpler model or **b)** need a model general enough to fit weird correlations, in which case you should try out ML.