Identification of the Discount Factor in DDC Models

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Fang & Wang (2015) *generic identification* result for hyperbolic discount functions is incorrect

In a model of partially naive agents with exclusion restrictions similar to ours, F&W's Proposition 2 states that $(\delta, \tilde{\delta}, \beta)$ are generically identified

- Present bias parameters δ's
- Geometric discounting a special case with $(\delta, \tilde{\delta}) = (1, 1)$

But a mistake in the proof

- The proof in fact shows that its Proposition 2 is void
- Serves as a comment on the concept of generic identification more generally

We analyze the proof in detail in the paper

Fang & Wang (2015) *generic identification* argument

Specifies a DDC model with more exclusion restrictions than free parameters

- F&W Proposition 2 states that the discount function parameters are *generically identified* in the space of data that can be generated by the restricted model
  - → i.e. identified for *almost all* data that the model can generate
- Uses the transversality theorem to prove that with more moment conditions than free parameters, there is generically no set of primitives that can rationalize the data
- But by assumption, some set of primitives must have generated the data.
- Hence, except for a very small subset, there is a unique set of primitives that rationalizes the data

So generically point identified

F&W applies the transversality theorem to a wrong measure

- F&W's proof of Proposition 2 relies on showing that there are generically no primitives that can rationalize the data that can be generated by the restricted model
- F&W however applies the transversality theorem to the space of *all possible data*, which is a much larger set
- F&W's proof in fact shows that the space of data that can be generated by the restricted model has zero measure in the space of all possible data
- The transversality theorem excepts sets of zero measure

The transversality theorem therefore has nothing to say about the number of solutions to the restricted model, and hence about identification

- Though the identification result is void, the model developed in Fang & Wang is useful for discrete choice analysis of hyperbolic discount functions

Likely possible to prove Fang & Wang's intended generic identification result

We sketch how in the appendix

But generic identification is not that useful in practice

- Hard to characterize the singularities a priori
  - → The singularities often economically important
  - → Estimators often ill-behaved close to singularities, e.g. weak instruments
- May be hard to locate the shared zero in finite samples