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Vo Phuong Mai Le, David Meenagh, Patrick Minford,
Michael Wickens

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A Monte Carlo procedure for checking identification in DSGE models*

Vo Phuong Mai Le (Cardiff University)† David Meenagh (Cardiff University)‡
Patrick Minford (Cardiff University and CEPR)§
Michael Wickens (Cardiff University and CEPR)¶

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Abstract

We propose a numerical method, based on indirect inference, for checking the identification of a DSGE model. Monte Carlo samples are generated from the model's true structural parameters and a VAR approximation to the reduced form estimated for each sample. We then search for a different set of structural parameters that could potentially also generate these VAR parameters. If we can find such a set, the model is not identified. The test is both an alternative to using the rank condition and also can establish whether there is empirically weak identification.

Key words: identification, indirect inference, Monte Carlo, VAR, reduced form

1 Introduction

It has been usual for modellers to argue that DSGE models are over-identified because the rational expectations cross-equation restrictions supplement the normal identifying mechanisms of exclusion and sign. However in a recent paper Canova and Sala (2009) have questioned this view. They give examples of models in which the reduced form properties of DSGE models of different sorts are hard to distinguish and argue that a weak form of observational equivalence between DSGE models is widespread. They recommend careful exploration of these issues prior to estimation and testing of a particular DSGE model. In this paper we propose a numerical Monte Carlo method for checking the identification of a DSGE model which is simple to implement. We illustrate its application with two widely-used DSGE models, the Smets and Wouters (2007) model and the Gali et al. (2005) three-equation model.

To understand our approach consider the following straightforward definition of identification: a (structural DSGE) model is identified if and only if it has a reduced form representation which is not shared with any other such model. This simple definition makes it clear that for identification to fail there needs to be at least one other structural DSGE model that has the same reduced form; for it to exist there needs to be no other such model that has the same reduced form.

The indirect inference test we have discussed elsewhere (Le et al, 2016) compares the reduced form implied by a structural model possessing certain numerical parameters with the reduced form estimated on the sample data. If we generate the sample data by Monte Carlo resampling from the structural model, then plainly the reduced form estimated on this data will, because of sampling error, vary around the reduced form implied by the model. The indirect inference test of the model, at say 95% confidence, will have the generated data samples reject the model 5% of the time. The

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†LeVP@cardiff.ac.uk; Cardiff Business School, Cardiff University, Aberconway Building, Colum Drive, Cardiff, CF10 3EU, UK

‡MeenaghD@cardiff.ac.uk; Cardiff Business School, Cardiff University, Aberconway Building, Colum Drive, Cardiff, CF10 3EU, UK

§Patrick.minford@btinternet.com; Cardiff Business School, Cardiff University, Aberconway Building, Colum Drive, Cardiff, CF10 3EU, UK

¶Cardiff Business School, Cardiff University, Aberconway Building, Colum Drive, Cardiff, CF10 3EU, UK