A Dynamically Consistent Nonlinear Global Solution Method and Applications*

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Abstract

This paper develops a novel nonlinear global solution method for dynamic stochastic general equilibrium models, which is accurate in terms of dynamic consistency. The method is based on the ergodic theorem: if a simulated path of the aggregate shock is long enough, all the possible equilibrium outcomes are realized somewhere on the path. Then, the expected future value (policy) function at each period on the path can be completely characterized by identifying the periods with each possible future state realization and then combining the corresponding time-specific value (policy) functions, *without* specifying a law of motion. I theoretically show a sufficient statistic can be used to identify the periods sharing the same endogenous states, possibly distributions, if the individual levels of the value (policy) function are sorted strictly monotonically along with the statistic. The method accurately finds the global solution even for highly nonlinear models. The speed gain of the algorithm is particularly large when the model includes non-trivial market clearing conditions.

Keywords: Stochastic dynamic programming, nonlinear business cycle, heterogeneous agents, monotone function, state dependence.

JEL codes: E32, C63, D25.

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Contents

1 Introduction 3

2 Methodology 3

3 Sufficient statistic approach 3

4 Dynamic consistency 3

5 Accuracy and speed: Comparison with the existing methods 3

6 A representative application: An extension of Krusell and Smith (1998) 3

7 Conclusion 3

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