

## Solving Dsge Models With Perturbation Methods And A Change

This paper compares different solution methods for computing the equilibrium of dynamic stochastic general equilibrium (DSGE) models with rare disasters along the line of those proposed by Rietz (1988), Barro (2006), Gabaix (2012), and Gourio (2012). DSGE models with rare disasters require solution methods that can handle the large non-linearities triggered by low-probability, high-impact events with sufficient accuracy and speed. We solve a standard New Keynesian model with Epstein-Zin preferences and time-varying disaster risk with perturbation, Taylor projection, and Smolyak collocation. Our main finding is that Taylor projection delivers the best accuracy/speed tradeoff among the tested solutions. We also document that even third-order perturbations may generate solutions that suffer from accuracy problems and that Smolyak collocation can be costly in terms of run time and memory requirements.

We introduce a nonlinear infinite moving average as an alternative to the standard state-space policy function for solving nonlinear DSGE models. Perturbation of the nonlinear moving average policy function provides a direct mapping from a history of innovations to endogenous variables, decomposes the contributions from individual orders of uncertainty and nonlinearity, and enables familiar impulse response analysis in nonlinear settings. When the linear approximation is saddle stable and free of unit roots, higher order terms are likewise saddle stable and first order corrections for uncertainty are zero. We derive the third order approximation explicitly and examine the accuracy of the method using Euler equation tests. -- Perturbation ; nonlinear impulse response ; DSGE ; solution methods

Handbook of Computational Economics summarizes recent advances in economic thought, revealing some of the potential offered by modern computational methods. With computational power increasing in hardware and algorithms, many economists are closing the gap between economic practice and the frontiers of computational mathematics. In their efforts to accelerate the incorporation of computational power into mainstream research, contributors to this volume update the improvements in algorithms that have sharpened econometric tools, solution methods for dynamic optimization and equilibrium models, and applications to public finance, macroeconomics, and auctions. They also cover the switch to massive parallelism in the creation of more powerful computers, with advances in the development of high-power and high-throughput computing. Much more can be done to expand the value of computational modeling in economics. In conjunction with volume one (1996) and volume two (2006), this volume offers a remarkable picture of the recent development of economics as a science as well as an exciting preview of its future potential. Samples different styles and approaches, reflecting the breadth of computational economics as practiced today Focuses on problems with few well-developed solutions in the literature of other disciplines Emphasizes the potential for increasing the value of computational modeling in economics

How to use nonlinear dynamic models in policy analysis. Policymakers need quantitative as well as qualitative answers to pressing policy questions. Because of advances in computational methods, quantitative estimates are now derived from coherent nonlinear

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dynamic macroeconomic models embodying measures of risk and calibrated to capture specific characteristics of real-world situations. This text shows how such models can be made accessible and operational for confronting policy issues. The book starts with a simple setting based on market-clearing price flexibility. It gradually incorporates departures from the simple competitive framework in the form of price and wage stickiness, taxes, rigidities in investment, financial frictions, and habit persistence in consumption. Most chapters end with computational exercises; the Matlab code for the base model can be found in the appendix. As the models evolve, readers are encouraged to modify the codes from the first simple model to more complex extensions. Computational Macroeconomics for the Open Economy can be used by graduate students in economics and finance as well as policy-oriented researchers.

The highly prized ability to make financial plans with some certainty about the future comes from the core fields of economics. In recent years the availability of more data, analytical tools of greater precision, and ex post studies of business decisions have increased demand for information about economic forecasting. Volumes 2A and 2B, which follows Nobel laureate Clive Granger's Volume 1 (2006), concentrate on two major subjects. Volume 2A covers innovations in methodologies, specifically macroforecasting and forecasting financial variables. Volume 2B investigates commercial applications, with sections on forecasters' objectives and methodologies. Experts provide surveys of a large range of literature scattered across applied and theoretical statistics journals as well as econometrics and empirical economics journals. The Handbook of Economic Forecasting Volumes 2A and 2B provide a unique compilation of chapters giving a coherent overview of forecasting theory and applications in one place and with up-to-date accounts of all major conceptual issues. Focuses on innovation in economic forecasting via industry applications Presents coherent summaries of subjects in economic forecasting that stretch from methodologies to applications Makes details about economic forecasting accessible to scholars in fields outside economics

A unified and comprehensive introduction to the analytical and numerical tools for solving dynamic economic problems; substantially revised for the second edition. This book offers a unified, comprehensive, and up-to-date treatment of analytical and numerical tools for solving dynamic economic problems. The focus is on introducing recursive methods—an important part of every economist's set of tools—and readers will learn to apply recursive methods to a variety of dynamic economic problems. The book is notable for its combination of theoretical foundations and numerical methods. Each topic is first described in theoretical terms, with explicit definitions and rigorous proofs; numerical methods and computer codes to implement these methods follow. Drawing on the latest research, the book covers such cutting-edge topics as asset price bubbles, recursive utility, robust control, policy analysis in dynamic New Keynesian models with the zero lower bound on interest rates, and Bayesian estimation of dynamic stochastic general equilibrium (DSGE) models. This second edition has been substantially updated. Responding to renewed interest in modeling with multiple equilibria, it incorporates new material on this topic throughout. It offers an entirely new chapter on deterministic nonlinear systems, and provides new material on such topics as linear planar systems, chaos, bifurcations, indeterminacy and sunspot solutions, pruning nonlinear solutions, the bandit problem, rational inattention models, bequests, self-



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model to shed new light on a number of important issues. It analyses the role of fiscal policy in stabilizing the economy while maintaining debt sustainability; expands the model to include a banking sector and show how banks amplify the booms and busts; and explains how animal spirits help to synchronize the business cycles across countries. The model set out in Behavioural Macroeconomics leads to very different policy implications from the mainstream macroeconomic model. It shows how policymakers have a responsibility to stabilize an otherwise unstable system.

This book summarizes the evolution of modern macroeconomics (New Consensus Macroeconomics, NCM) and proposes a new approach to theoretical and empirical analysis, which is based on a recently developed dynamic stochastic general equilibrium (DSGE) model. Dynamic macroeconomic analysis in emerging market economies is challenging, and of growing importance in the global economy, where emerging markets are becoming more and more influential. Clearly, a deeper understanding of the inner workings of emerging economies, particularly with respect to their socioeconomic structure and the urbanization process, is needed. The book's extends the NCM/DSGE model to better account for significant economic and social features in emerging market economies. In particular, household heterogeneities and social stratification are explicitly incorporated into the framework proposed here, substantially enhancing the comprehensiveness of the model economy, and allowing it to better account for underlying social structure in emerging economies. Furthermore, financial and housing markets have not been considered sufficiently in either the advanced or emerging economy literature, an oversight this book remedies. As such, it makes an original and valuable contribution to the field, and a direction for future research.

Markov-switching DSGE (MSDSGE) modeling has become a growing body of literature on economic and policy issues related to structural shifts. This paper develops a general perturbation methodology for constructing high-order approximations to the solutions of MSDSGE models. Our new method, called "the partition perturbation method," partitions the Markov-switching parameter space to keep a maximum number of time-varying parameters from perturbation. For this method to work in practice, we show how to reduce the potentially intractable problem of solving MSDSGE models to the manageable problem of solving a system of quadratic polynomial equations. We propose to use the theory of Gröbner bases for solving such a quadratic system. This approach allows us to first obtain all the solutions and then determine how many of them are stable. We illustrate the tractability of our methodology through two examples.

This is a book on deterministic and stochastic Growth Theory and the computational methods needed to produce numerical solutions. Exogenous and endogenous growth models are thoroughly reviewed. Special attention is paid to the use of these models for fiscal and monetary policy analysis. Modern Business Cycle Theory, the New Keynesian Macroeconomics, the class of Dynamic Stochastic General Equilibrium models, can be all considered as special cases of models of economic growth, and they can be analyzed by the theoretical and numerical procedures provided in the textbook. Analytical discussions are presented in full detail. The book is self contained and it is designed so that the student advances in the theoretical and the computational issues in parallel. EXCEL and Matlab files are provided on an accompanying website to illustrate theoretical results as well as to simulate the effects of economic policy interventions.

It is widely acknowledged that the recent generation of DSGE models failed to incorporate many of the liquidity and financial accelerator mechanisms revealed in the global financial crisis that began in 2007. This paper complements the papers presented at the 2009 BIS annual conference focused on the role of banks and other financial institutions by analysing the role of household





performance of the methods in terms of computing time, implementation complexity, and accuracy. Our main finding is that a third-order perturbation is competitive in terms of accuracy with Chebyshev polynomials and value function iteration, while being an order of magnitude faster to run. Therefore, we conclude that perturbation methods are an attractive approach for computing this class of problems.

This is the third of three volumes containing edited versions of papers and commentaries presented at invited symposium sessions of the Tenth World Congress of the Econometric Society, held in Shanghai in August 2010. The papers summarize and interpret key developments in economics and econometrics, and they discuss future directions for a wide variety of topics, covering both theory and application. Written by the leading specialists in their fields, these volumes provide a unique, accessible survey of progress on the discipline. The first volume primarily addresses economic theory, with specific focuses on nonstandard markets, contracts, decision theory, communication and organizations, epistemics and calibration, and patents.

Using a dynamic stochastic general equilibrium model, we study the channels through which natural disaster shocks affect macroeconomic outcomes and welfare in disaster-prone countries. We solve the model using Taylor projection, a solution method that is shown to deal effectively with high-impact weather shocks calibrated in accordance to empirical evidence. We find large and persistent effects of weather shocks that significantly impact the income convergence path of disaster-prone countries. Relative to non-disaster-prone countries, on average, these shocks cause a welfare loss equivalent to a permanent fall in consumption of 1.6 percent. Welfare gains to countries that self-finance investments in resilient public infrastructure are found to be negligible, and international aid has to be sizable to achieve significant welfare gains. In addition, it is more cost-effective for donors to contribute to the financing of resilience before the realization of disasters, rather than disbursing aid after their realization.

An integrated analysis of how financial frictions can be accounted for in macroeconomic models built to study monetary policy and macroprudential regulation. Since the global financial crisis, there has been a renewed effort to emphasize financial frictions in designing closed- and open-economy macroeconomic models for monetary and macroprudential policy analysis. Drawing on the extensive literature of the past decade as well as his own contributions, in this book Pierre-Richard Agénor provides a unified set of theoretical and quantitative macroeconomic models with financial frictions to explore issues that have emerged in the wake of the crisis. These include the need to understand better how the financial system amplifies and propagates shocks originating elsewhere in the economy; how it can itself be a source of aggregate fluctuations; the extent to which central banks should account for financial stability considerations in the conduct of monetary policy; whether national central banks and regulators should coordinate their policies to promote macroeconomic and financial stability; and how much countercyclical macroprudential

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policies should be coordinated at the international level to mitigate financial spillovers across countries. Agénor focuses on upper middle-income countries, which differ from advanced economies in terms of both their structural features (which include a financial sector dominated by banks, weak supervisory capacity, and a high degree of vulnerability to external shocks) and their long-standing policy challenges (such as managing volatile capital flows). Some of the analytical insights and broad policy lessons that can be drawn from the book will be of relevance to advanced economies as well.

Top scholars synthesize and analyze scholarship on this widely used tool of policy analysis in 27 articles, setting forth its accomplishments, difficulties, and means of implementation. Though CGE modeling does not play a prominent role in top U.S. graduate schools, it is employed universally in the development of economic policy. This collection is particularly important because it presents a history of modeling applications and examines competing points of view. Presents coherent summaries of CGE theories that inform major model types Covers the construction of CGE databases, model solving, and computer-assisted interpretation of results Shows how CGE modeling has made a contribution to economic policy

This volume of *Advances in Econometrics* contains articles that examine key topics in the modeling and estimation of dynamic stochastic general equilibrium (DSGE) models. Because DSGE models combine micro- and macroeconomic theory with formal econometric modeling and inference, over the past decade they have become an established framework for analyzing a variety of issues in empirical macroeconomics. The research articles make contributions in several key areas in DSGE modeling and estimation. In particular, papers cover the modeling and role of expectations, the study of optimal monetary policy in two-country models, and the problem of non-invertibility. Other interesting areas of inquiry include the analysis of parameter identification in new open economy macroeconomic models and the modeling of trend inflation shocks. The second part of the volume is devoted to articles that offer innovations in econometric methodology. These papers advance new techniques for addressing major inferential problems and include discussion and applications of Laplace-type, frequency domain, empirical likelihood and method of moments estimators.

Provides an overview and exploration of methodologies, models, and techniques used to analyze forces shaping national economies. This title presents a range of methods for characterizing and evaluating empirical implications, including calibration exercises, method-of-moment procedures, and likelihood-based procedures, both classical and Bayesian.

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