Policy Analysis Using Dsge Models An Introduction

The last twenty years have witnessed tremendous advances in the mathematical, statistical, and computational tools available to applied macroeconomists. This rapidly evolving field has redefined how researchers test models and validate theories. Yet until now there has been no textbook that unites the latest methods and bridges the divide between theoretical and applied work. Fabio Canova brings together dynamic equilibrium theory, data analysis, and advanced econometric and computational methods to provide the first comprehensive set of techniques for use by academic economists as well as professional macroeconomists in banking and finance, industry, and government. This graduate-level textbook is for readers knowledgeable in modern macroeconomic theory, econometrics, and computational programming using RATS, MATLAB, or Gauss. Inevitably a modern treatment of such a complex topic requires a quantitative perspective, a solid dynamic theory background, and the development of empirical and numerical methods--which is where Canova's book differs from typical graduate textbooks in macroeconomics and econometrics. Rather than list a series of estimators and their properties, Canova starts from a class of DSGE models, finds an approximate linear representation for the decision rules, and describes methods needed to estimate their parameters, examining their fit to the data. The book is complete with numerous examples and exercises. Today's economic analysts need a strong foundation in both theory and application. Methods for Applied Macroeconomic Research offers the essential tools for the next generation of macroeconomists.

When estimating DSGE models, the number of observable economic variables is usually kept small, and it is conveniently assumed that DSGE model variables are perfectly measured by a single data series. Building upon Boivin and Giannoni (2006), we relax these two assumptions and estimate a fairly simple monetary DSGE model on a richer data set. Using post-1983 U.S.data on real output, inflation, nominal interest rates, measures of inverse money velocity, and a large panel of informational series, we compare the data-rich DSGE model with the regular - few observables, perfect measurement - DSGE model in terms of deep parameter estimates, propagation of monetary policy and technology shocks and sources of business cycle fluctuations. We document that the data-rich DSGE model generates a higher implied duration of Calvo price contracts and a lower slope of the New Keynesian Phillips curve. To reduce the computational costs of the likelihood-based estimation, we employed a novel speedup as in Jungbacker and Koopman (2008) and achieved the time savings of 60 percent.

With the collapse of the Bretton Woods system, any pretense of a connection of the world's currencies to any real commodity has been abandoned. Yet since the 1980s, most central banks have abandoned money-growth targets as practical guidelines for monetary policy as well. How then can pure "fiat" currencies be managed so as to create confidence in the stability of national units of account? Interest and Prices seeks to provide theoretical foundations for a rule-based approach to monetary policy suitable for a world of instant communications and ever more efficient financial markets. In such a world, effective monetary policy requires that central banks construct a conscious and articulate account of what they are doing. Michael Woodford reexamines the foundations of monetary economics, and shows how interest-rate policy can be used to achieve an inflation target in the absence of either commodity backing or control of a monetary aggregate. The book further shows how the tools of modern macroeconomic theory can be used to design an optimal inflation-targeting regime--one that balances stabilization goals with the pursuit of price stability in a way that is grounded in an explicit welfare analysis, and that takes account of the "New Classical" critique of traditional policy evaluation exercises. It thus argues that rule-based policymaking need not mean adherence to a rigid framework unrelated to stabilization objectives for the sake of credibility, while at the same time showing the advantages of rule-based over purely discretionary policymaking.

The Great Recession seems to be a natural experiment for economic analysis, in that it has shown the inadequacy of the predominant theoretical framework - the New Neoclassical Synthesis (NNS) - grounded on the DSGE model. In this paper, we present a critical discussion of the theoretical, empirical and political-economy pitfalls of the DSGE-based approach to policy analysis. We suggest that a more fruitful research avenue should escape the strong theoretical requirements of NNS models (e.g., equilibrium, rationality, representative agent, etc.) and consider the economy as a complex evolving system, i.e. as an ecology populated by heterogenous agents, whose far-from-equilibrium interactions continuously change the structure of the system. This is indeed the methodological core of agent-based computational economics (ACE), which is presented in this paper. We also discuss how ACE has been applied to policy analysis issues, and we provide a survey of macroeconomic policy applications (fiscal and monetary policy, bank regulation, labor market structural reforms and climate change interventions). Finally, we conclude by discussing the methodological status of ACE, as well as the problems it raises.

Financial Crises in DSGE Models: Selected Applications of MAPMOD

An Analysis Based on a DSGE Model with Banking

New Developments and Challenges Ahead

The Oxford Handbook of Economic Forecasting

A New Keynesian Perspective

Monetary Policy Analysis with Potentially Misspecified Models

Yes, it makes a lot of sense. This paper studies how to design simple loss functions for central banks, as parsimonious approximations to social welfare. We show, both analytically and quantitatively, that simple loss functions should feature a high weight on measures of economic activity, sometimes even larger than the weight on inflation. Two main factors drive our result. First, stabilizing economic activity also stabilizes other welfare relevant variables. Second, the estimated model features mitigated inflation distortions due to a low elasticity of substitution between monopolistic goods and a low interest rate sensitivity of demand. The result holds up in the presence of measurement errors, with large shocks that generate a trade-off between stabilizing inflation and resource utilization, and also when ensuring a low probability of hitting the zero lower bound on interest rates.

This book retraces the history of macroeconomics from Keynes's General Theory to the present. Central to it is the contrast between a Keynesian era and a Lucasian - or dynamic stochastic general equilibrium (DSGE) - era, each ruled by distinct methodological standards. In the Keynesian era, the book studies the following theories: Keynesian macroeconomics, monetarism, disequilibrium macro (Patinkin, Leijongufvud, and Clower) non-Walrasian equilibrium models, and first-generation new Keynesian models. Three stages are identified in the DSGE era: new classical macro (Lucas), RBC modelling, and second-generation new Keynesian modeling. The book also examines a few selected works aimed at presenting alternatives to Lucasian macro. While not eschewing analytical content, Michel De Vroey focuses on substantive assessments, and the models studied are presented in a pedagogical and vivid yet critical way.

This paper evaluates monetary policy-tradeoffs in low-income countries using a dynamic stochastic general equilibrium (DSGE) model estimated on data for Mozambique taking into account the sources of major exogenous shocks, and level of financial

development. To our knowledge this is a first attempt at estimating a DSGE model for Sub-Saharan Africa excluding South Africa. Our simulations suggests that a exchange rate peg is significantly less successful than inflation targeting at stabilizing the real economy due to higher interest rate volatility, as in the literature for industrial countries and emerging markets.

This paper presents the theoretical structure of MAPMOD, a new IMF model designed to study vulnerabilities associated with excessive credit expansions, and to support macroprudential policy analysis. In MAPMOD, bank loans create purchasing power that facilitates adjustments in the real economy. But excessively large and risky loans can impair balance sheets and sow the seeds of a financial crisis. Banks respond to losses through higher spreads and rapid credit cutbacks, with adverse effects for the real economy. These features allow the model to capture the basic facts of financial cycles. A companion paper studies the simulation properties of MAPMOD.

Monetary Policy, Inflation, and the Business Cycle

Unemployment Fluctuations and Stabilization Policies

DSGE Models and Central Banks

Identification Versus Misspecification in New Keynesian Monetary Policy Models

Does a Dual Mandate Make Sense?

In recent years, New Keynesian dynamic stochastic general equilibrium (NK DSGE) models have become increasingly popular in the academic literature and in policy analysis. However, the success of these models in reproducing the dynamic behavior of an economy following structural shocks is still disputed. This paper attempts to shed light on this issue. We use a VAR with sign restrictions that are robust to model and parameter uncertainty to estimate the effects of monetary policy, preference, government spending, investment, price markup, technology, and labor supply shocks on macroeconomic variables in the United States and the euro area. In contrast to the NK DSGE models, the empirical results indicate that technology shocks have a positive effect on hours worked, and investment and preference shocks have a positive impact on consumption and investment, respectively. While the former is in line with the predictions of Real Business Cycle models, the latter indicates the relevance of accelerator effects, as described by earlier Keynesian models. We also show that NK DSGE models might overemphasize the contribution of cost-push shocks to business cycle fluctuations while, at the same time, underestimating the importance of other shocks such as changes to technology and investment adjustment costs.

Bridging the theory and practice of monetary policy, this book presents aspects of the New-Keynesian theory of monetary policy and its implications for the practical decision-making of central bankers. It also outlines important lessons for policymakers.

A new approach for introducing unemployment into the New Keynesian framework. The past fifteen years have witnessed the rise of the New Keynesian model as a framework of reference for the analysis of fluctuations and stabilization policies. That framework, which combines the rigor and internal consistency of dynamic general equilibrium models with such typically Keynesian assumptions as

monopolistic competition and nominal rigidities, makes possible a meaningful, welfare-based analysis of the effects of monetary policy rules. But the conspicuous absence of unemployment from the standard New Keynesian model has given rise to both criticism and attempts to rectify this anomaly. In this book, Jordi Galí, one of the major contributors to the New Keynesian literature, offers a new approach to introducing unemployment into that framework. Galí's approach involves a reinterpretation of the labor market in the standard New Keynesian model with staggered wage setting (rather than a modification or extension of the model, as has been proposed by others). The resulting framework preserves the convenience of the representative household paradigm and allows one to determine the equilibrium levels of employment, the labor force, and hence the unemployment rate conditional on the monetary policy in place. Galí develops the basic model, embedding it in a standard New Keynesian framework with staggered price and wage setting; revisits the relationship between economic fluctuations and efficiency through the lens of the new model, developing a measure of the output gap; and analyzes the relation between unemployment and the design of monetary policy.

Abstract: Estimated dynamic stochastic equilibrium (DSGE) models are now widely used for empirical research in macroeconomics as well as for quantitative policy analysis and forecasting at central banks around the world. This paper reviews recent advances in the estimation and evaluation of DSGE models, discusses current challenges, and provides avenues for future research

An Estimated DSGE Model for Monetary Policy Analysis in Low-Income Countries

Financial Crises in DSGE Models: A Prototype Model

Financial Crises in DSGE Models

Understanding DSGE Filters in Forecasting and Policy Analysis

Dynamic Macroeconomic Models in Emerging Market Economies

A History of Macroeconomics from Keynes to Lucas and Beyond

Annotation Part 6: Financial Markets and the Macroeconomy. 19. Asset prices, consumption, and the business cycle (J.Y. Campbell). 20. Human behavior and the efficiency of the financial system (R.J. Shiller). 21. The financial accelerator in a quantitative business cycle framework (B. Bernanke, M. Gertler and S. Gilchrist). Part 7: Monetary and Fiscal Policy. 22. Political economics and macroeconomic policy (T. Persson, G. Tabellini). 23. Issues in the design of monetary policy rules (B.T. McCallum). 24. Inflation stabilization and BOP crises in developing countries (G.A. Calvo, C.A. Vegh). 25. Government debt (D.W. Elmendorf, N.G. Mankiw). 26. Optimal fiscal and monetary policy (V.V. Chari, P.J. Kehoe).

This paper introduces methods that allow analysts to (i) decompose the estimates of unobserved quantities into observed data, (ii) to better understand revision properties of the model, and (iii) to impose subjective prior constraints on path estimates of unobserved shocks in structural economic models. For instance, a decomposition of the flexible-price output gap, or a technology shock, into contributions of output, inflation, interest rates, and other observed variables' contribution is feasible. The intuitive nature and analytical clarity of the suggested procedures are appealing for policy-related and forecasting models.

Bayesian econometric methods have enjoyed an increase in popularity in recent years. Econometricians, empirical economists, and policymakers are increasingly making use of Bayesian methods. This handbook is a single source for researchers and policymakers wanting to learn about Bayesian methods in specialized fields, and for graduate students seeking to make the final step from textbook learning to the research frontier. It contains contributions by leading Bayesians on the latest developments in their specific fields of expertise. The volume provides broad coverage of the application of Bayesian econometrics in the major fields of economics and related disciplines, including macroeconomics, microeconomics, finance, and marketing. It reviews the state of the art in Bayesian econometric methodology, with chapters on posterior simulation and Markov chain Monte Carlo methods, Bayesian nonparametric techniques, and the specialized tools used by Bayesian time series econometricians such as state space models and particle filtering. It also includes chapters on Bayesian principles and methodology.

While dynamic stochastic general equilibrium (DSGE) models for monetary policy analysis have come a long way, there is considerable difference of opinion over the role these models should play in the policy process. The paper develops three main points about assessing the value of these models. First, we document that DSGE models continue to have aspects of crude approximation and omission. This motivates the need for tools to reveal the strengths and weaknesses of the models--both to direct development efforts and to inform how best to use the current flawed models. Second, posterior predictive analysis provides a useful and economical tool for finding and communicating strengths and weaknesses. In particular, we adapt a form of discrepancy analysis as proposed by Gelman, et al. (1996). Third, we provide a nonstandard defense of posterior predictive analysis in the DSGE context against long-standing objections. We use the iconic Smets-Wouters model for illustrative purposes, showing a number of heretofore unrecognized properties that may be important from a policymaking perspective.

Posterior predictive analysis for evaluating DSGE models

An Advanced Guide to Trade Policy Analysis

Selected Applications of MAPMOD

Foundations of a Theory of Monetary Policy

The Oxford Handbook of Bayesian Econometrics

Handbook of Macroeconomics

Policy analysis with potentially misspecified dynamic stochastic general equilibrium (DSGE) models faces two challenges: estimation of parameters that are relevant for policy trade-offs and treatment of estimated deviations from the cross-equation restrictions. This paper develops and explores policy analysis approaches that are either based on a generalized shock structure for the DSGE model or the explicit modelling of deviations from cross-equation restrictions. Using post-1982 U.S. data we first quantify the degree of misspecification in a state-of-the-art DSGE model and then document the performance of different interest-rate feedback rules. We find that many of the policy prescriptions derived from the benchmark DSGE model are robust to the various treatments of misspecifications considered in this paper, but that quantitatively the cost of deviating from such prescriptions varies substantially.

In this paper, we study identification and misspecification problems in standard closed and open-economy empirical New-Keynesian DSGE models used in monetary policy analysis. We find that problems with model misspecification still appear to be a first-order issue in monetary DSGE models, and argue that it is problems with model misspecification that may benefit the most from moving from a classical to a Bayesian framework. We also argue that lack of identification should neither be ignored nor be assumed to affect all DSGE models. Fortunately, identification problems can be readily assessed on a case-by-case basis, by applying recently developed pre-tests of identification.

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 analy

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.

Construction and Bayesian Estimation of DSGE Models for the Euro Area

Putting the New Keynesian Model to a Test

On the Fit and Forecasting Perfomance of New Keynesian Models

Interest and Prices

Estimation, Evaluation and New Developments

A Statistical Framework

Dynamic stochastic general equilibrium (DSGE) models have become one of the workhorses of modern macroeconomics and are extensively used for academic research as well as forecasting and policy analysis at central banks. This book introduces readers to state-of-the-art computational techniques used in the Bayesian analysis of DSGE models. The book covers Markov chain Monte

Carlo techniques for linearized DSGE models, novel sequential Monte Carlo methods that can be used for parameter inference, and the estimation of nonlinear DSGE models based on particle filter approximations of the likelihood function. The theoretical foundations of the algorithms are discussed in depth, and detailed empirical applications and numerical illustrations are provided. The book also gives invaluable advice on how to tailor these algorithms to specific applications and assess the accuracy and reliability of the computations. Bayesian Estimation of DSGE Models is essential reading for graduate students, academic researchers, and practitioners at policy institutions.

DSGE Models for Monetary Policy Analysis

"This text is aimed at a Master's level course in Macroeconomics with a strong emphasis on the theoretical underpinnings and computational methods used in modern macro. It is well suited to the first semester of a Ph.D. course in Macroeconomics or a high-level undergraduate course. It covers monetary economics and fiscal policy in depth. It also introduces students to connecting models and data in order to gauge how well our model captures key elements in the data, as well as to the reverse engineering that goes into fitting models to the data. A wide variety of empirical and computational methods are covered, as are Lagrangian methods in the theoretical analysis"--

Greater data availability has been coupled with developments in statistical theory and economic theory to allow more elaborate and complicated models to be entertained. These include factor models, DSGE models, restricted vector autoregressions, and non-linear models.

Bayesian Estimation of DSGE Models

DSGE Models in Macroeconomics

The Structural Gravity Model

Practical Tools for Policy Analysis in DSGE Models with Missing Channels

A Prototype Model

Estimation and Evaluation of DSGE Models

Over the past 15 years there has been remarkable progress in the specification and estimation of dynamic stochastic general equilibrium (DSGE) models. Central banks in developed and emerging market economies have become increasingly interested in their usefulness for policy analysis and forecasting. This paper reviews some issues and challenges surrounding the use of these models at central banks. It recognises that they offer coherent frameworks for structuring policy discussions. Nonetheless, they are not ready to accomplish all that is being asked of them. First, they still need to incorporate relevant transmission mechanisms or sectors of the economy; second, issues remain on how to empirically validate them; and finally, challenges remain on how to effectively communicate their features and implications to policy makers and to

the public. Overall, at their current stage DSGE models have important limitations. How much of a problem this is will depend on their specific use at central banks.

The global financial crisis has reaffirmed the importance of financial factors for macroeconomic fluctuations. Recent work has shown how the conventional pre-crisis prescription that monetary policy should pay no attention to financial variables over and above their effects on inflation may no longer be valid in models that consider frictions in financial intermediation (Cúrdia and Woodford, 2009). This paper analyzes whether Taylor rules augmented with asset prices and credit can improve upon a standard rule in terms of macroeconomic stabilization in a DSGE with both a firms' balance-sheet channel and a bank-lending channel and in which the spread between lending and policy rates endogenously depends on banks' leverage. The main result is that, even in a model in which financial stability does not represent a distinctive policy objective, leaning-against-the-wind policies are desirable in the case of supply-side shocks whenever the central bank is concerned with output stabilization, while both strict inflation targeting and a standard rule are less effective. The gains are amplified if the economy is characterized by high private sector indebtedness.

"This paper uses a novel method for conducting policy analysis with potentially misspecified DSGE models (Del Negro and Schorfheide 2004) and applies it to a simple New Keynesian DSGE model. We illustrate the sensitivity of the results to assumptions on the policy invariance of model misspecifications"--Federal Reserve Bank of Atlanta web site.

This working paper presents a comprehensive overview of the theoretical structure of the Global Integrated Monetary and Fiscal Model (GIMF), a multi-region dynamic general equilibrium model that is used by the IMF for a variety of tasks including policy analysis, risk analysis, and surveillance.

The Deutsche Bank Prize in Financial Economics 2007

Theoretical Structure

Designing a Simple Loss Function for Central Banks

Macroeconomic Policy in DSGE and Agent-Based Models Redux

Stock Prices and Monetary Policy

Methods for Applied Macroeconomic Research

Dynamic Stochastic General Equilibrium (DSGE) models have become a standard tool in various fields of economics. This type of models has a superior theoretical foundation when compared to the Keynesian models which are traditionally used for policy analysis and forecasting. Although a lot has been

done to improve the empirical properties of DSGE models, there is still a need for further research in this field. In this book, the author first considers a closed economy general equilibrium framework to empirically validate the alternative mechanisms for introducing nominal rigidities. As the comparison is done in the context of the Euro area aggregate data, the results provide guidance to researchers dealing with estimation of Euro area DSGE models in general. In the second part of the book, a coherent economic and statistical framework that approximates the structure of the EMU and explicitly accounts for the historical monetary regime change is presented. In such a framework the disaggregate information on the Euro area can be utilized, so that one can explain the area-wide aggregates, and also examine the cross-region linkages.

This paper, together with a technical companion paper, presents MAPMOD, a new IMF model designed to study vulnerabilities associated with excessive credit expansions, and to support macroprudential policy analysis. In MAPMOD, bank loans create purchasing power that facilitates adjustments in the real economy. But excessively large and risky loans can impair balance sheets and sow the seeds of a financial crisis. Banks respond to losses through higher spreads and rapid credit cutbacks, with adverse effects for the real economy. These features allow the model to capture the basic facts of both the pre-crisis and crisis phases of financial cycles.

An Advanced Guide to Trade Policy Analysis provides the most recent tools for analysis of trade policy using structural gravity models.

Monetary DSGE models are widely used because they fit the data well and they can be used to address important monetary policy questions. We provide a selective review of these developments. Policy analysis with DSGE models requires using data to assign numerical values to model parameters. The chapter describes and implements Bayesian moment matching and impulse response matching procedures for this purpose -- National Bureau of Economic Research web site.

Estimated DSGE Models for Monetary Policy Analysis in Uganda

An Introduction to the New Keynesian Framework and Its Applications - Second Edition

Should Monetary Policy Lean Against the Wind?

DSGE Modelling with Financial and Housing Sectors

Progress and Challenges

The Science and Practice of Monetary Policy Today

The classic introduction to the New Keynesian economic model This revised second edition of Monetary Policy, Inflation, and the Business Cycle provides a rigorous graduate-level introduction to the New Keynesian framework and its applications to monetary policy. The New Keynesian framework is the workhorse for the analysis of monetary policy and its implications for inflation, economic fluctuations, and welfare. A backbone of the new generation of medium-scale models under development at major central banks and international policy institutions, the framework provides the theoretical underpinnings for the price stability–oriented strategies adopted by most central banks in the industrialized world. Using a canonical version of the New Keynesian model as a reference, Jordi Galí explores various issues pertaining to monetary policy's design, including optimal monetary policy and the desirability of simple policy rules. He analyzes several extensions of the baseline model, allowing for cost-push shocks, nominal wage rigidities, and open economy factors. In each case, the effects on monetary policy are addressed, with emphasis on the desirability of inflation-targeting policies. New material includes the zero lower bound on nominal interest rates and an analysis of unemployment's significance for monetary policy. The most up-to-date introduction to the New Keynesian framework available A single benchmark model used throughout New materials and exercises included An ideal resource for graduate students, researchers, and market analysts

Monetary DSGE models are widely used because they fit the data well and can be used to address important monetary policy questions. We provide a selective review of these developments. Policy analysis with DSGE models requires using data to assign numerical values to model parameters. The paper describes and implements Bayesian moment matching and impulse response matching procedures for this purpose.
Policy Predictions If the Model Doesn't Fit
Monetary and Fiscal Policy Through a DSGE Lens
Bayesian Dynamic Factor Analysis of a Simple Monetary DSGE Model
DSGE Models for Monetary Policy Analysis
The Global Integrated Monetary and Fiscal Model (GIMF)