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A new comparative approach to macroeconomic modeling and policy analysis☆

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ABSTRACT

In the aftermath of the global financial crisis, the state of macroeconomic modeling and the use of macroeconomic models in policy analysis has come under heavy criticism. Macroeconomists in academia and policy institutions have been blamed for relying too much on a particular class of macroeconomic models. This paper proposes a comparative approach to macroeconomic policy analysis that is open to competing modeling paradigms. Macroeconomic model comparison projects have helped produce some very influential insights such as the Taylor rule. However, they have been infrequent and costly, because they require the input of many teams of researchers and multiple meetings to obtain a limited set of comparative findings. This paper provides a new approach that enables individual researchers to conduct model comparisons easily, frequently, at low cost and on a large scale. Using this approach a model archive is built that includes many well-known empirically estimated models that may be used for quantitative analysis of monetary and fiscal stabilization policies. A computational platform is created that allows straightforward comparisons of models' implications. Its application is illustrated by comparing different monetary and fiscal policies across selected models. Researchers can easily include new models in the database and compare the effects of novel extensions to established benchmarks thereby fostering a comparative instead of insular approach to model development.

1. Introduction

The global financial crisis came as a surprise to many policy makers and their advisers as well as many professionals including business forecasters, financial advisors, bankers and researchers in finance and macroeconomics. Media and other commentators have criticized macroeconomists in particular for failing to predict the great recession of 2008–2009 or at least failing to provide adequate warning of the risk of such a recession ahead of time. Practitioners have attributed this failure to academic and central bank researchers' use of a particular modeling paradigm. They blame so-called dynamic

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stochastic general equilibrium (DSGE) models for misdirecting their attention. Indeed, even some well-known academics-cum-bloggers have published scathing commentaries on the current state of macroeconomic modeling. In March 2009, Willem Buiter wrote "*. . . the typical graduate macroeconomics and monetary economics training received at Anglo-American universities during the past 30 years or so, may have set back by decades serious investigations of aggregate economic behavior and economic policy-relevant understanding.*" He was echoed by Nobel Prize Winner Paul Krugman in the Economist, June 2010, "*Most work in macro-economics in the past 30 years has been useless at best and harmful at worst.*" Of course, not all experts agree on this judgement as indicated, for example, by the recent award of the Nobel Prize in 2011 to macroeconomists Thomas Sargent and Christopher Sims for "*their empirical research on cause and effect in the macroeconomy*".

Against this background, the present paper aims to develop a more constructive proposal for how to use macroeconomic modeling – whether state-of-the-art or 1970s-vintage – in practical policy design. In the spirit of the 1992 call by leading economists – among them Nobel prize winners Paul Samuelson and Franco Modigliani – for a pluralistic yet rigorous economics, we propose a systematic comparative approach to macroeconomic modeling with the objective of identifying policy recommendations that are robust to model uncertainty.[1] This approach is open to a wide variety of modeling paradigms. Scientific rigor demands a level-playing field on which models can compete. Instead of using rhetoric to dismiss competing approaches, models should be required to satisfy empirical benchmarks. For example, models used for monetary policy analysis should be estimated to fit key time series such as output, inflation and nominal interest rates. Models should also be able to provide answers to typical policymakers' questions.

Macroeconomic data, however, are unlikely to provide sufficient testing grounds for selecting a single, preferred model for policy purposes. If many of the competing models describe historical data of key aggregates reasonably well, one could use these models to establish *robustness* of policy recommendations. Such an approach is recommended by McCallum (1988, 1999), Blanchard and Fischer (1989), Taylor (1999) and many others. McCallum (1999), for example, proposes *"to search for a policy rule that possesses robustness in the sense of yielding reasonably desirable outcomes in policy simulation experiments in a wide variety of models."* [2] In 2010, ECB President Jean-Claude Trichet expressed the need for robustness as follows:

> *"We need macroeconomic and financial models to discipline and structure our judgemental analysis. How should such models evolve? The key lesson I would draw from our experience is the danger of relying on a single tool, methodology or paradigm. Policy-makers need to have input from various theoretical perspectives and from a range of empirical approaches. Open debate and a diversity of views must be cultivated – admittedly not always an easy task in an institution such as a central bank. We do not need to throw out our DSGE and asset-pricing models: rather we need to develop complementary tools to improve the robustness of our overall framework".*[3]

Yet, systematic comparisons of the empirical implications of a large variety of available models are rare. Evaluating the performance of different policies across many models typically is work intensive and costly. The seven comparison projects reported in Bryant et al. (1988), Bryant et al. (1989), Klein (1991), Bryant et al. (1993), Taylor (1999), Hughes-Hallett and Wallis (2004) and Coenen et al. (2012) have involved multiple teams of researchers, each team working only with one or a small subset of available models. While these initiatives have helped produce some very influential insights such as the Taylor rule,[4] the range of systematic, comparative findings has remained limited.

This paper provides a new comparative approach to model-based research and policy analysis that enables individual researchers to conduct systematic model comparisons and policy evaluations easily and at low cost. Following this approach it is straightforward to include new models and compare their empirical and policy implications to a large number of established benchmarks.

We start by presenting a formal exposition of our approach to model comparison. A general class of nonlinear dynamic stochastic macroeconomic models is augmented with a space of common comparable variables, parameters and shocks. Augmenting models in this manner is a necessary pre-condition for a systematic comparison of particular model characteristics. On this basis, common policy rules can be defined as model input. Then we derive comparable objects that may be produced as model output. These objects are defined in terms of common variables, parameters and shocks. Examples for such objects are impulse response functions, autocorrelation functions and unconditional distributions of key macroeconomic aggregates. An illustrative example with two well-known small New Keynesian models is provided.

Next, we give a brief overview of the model archive that we have built. This database includes many well-known empirically estimated macroeconomic models that may be used for quantitative analysis of monetary and fiscal stabilization policies. There are many models of the United States and euro area economies. Furthermore, the archive includes several multi-country models and open-economy models of Canada, Chile and Brazil. Some of the models are fairly small and focus

[1] The undersigned were concerned with "*the threat to economic science posed by intellectual monopoly*" and pleaded for "*a new spirit of pluralism in economics, involving critical conversation and tolerant communication between different approaches*". See the advertisement section of the American Economic Review – AEA Papers and Proceedings issue of May 1992.

[2] Taylor and Wieland (forthcoming) follow this recommendation and investigate the policy implications of three well-known models of the U.S. economy that are also made available in the database presented in this paper.

[3] This quote is taken from a speech titled "Reflections on the nature of monetary policy non-standard measures and finance theory" by Jean-Claude Trichet, then-President of the European Central Bank, on the occasion of the ECB Central Banking Conference Frankfurt, 18 November 2010.

[4] Taylor (1993a) credits the comparison project summarized in Bryant et al. (1993) as the crucial testing ground for what later became known as the Taylor rule.