

# Dynamic Stochastic General-Equilibrium Modeling:

## *10th Annual Advances in Econometrics Conference*

The Globalization and Monetary Policy Institute and economics department at Southern Methodist University cosponsored the 10th annual Advances in Econometrics Conference in 2011. The conference highlighted progress made in the development of dynamic stochastic general-equilibrium (DSGE) models for use in monetary policy analysis.

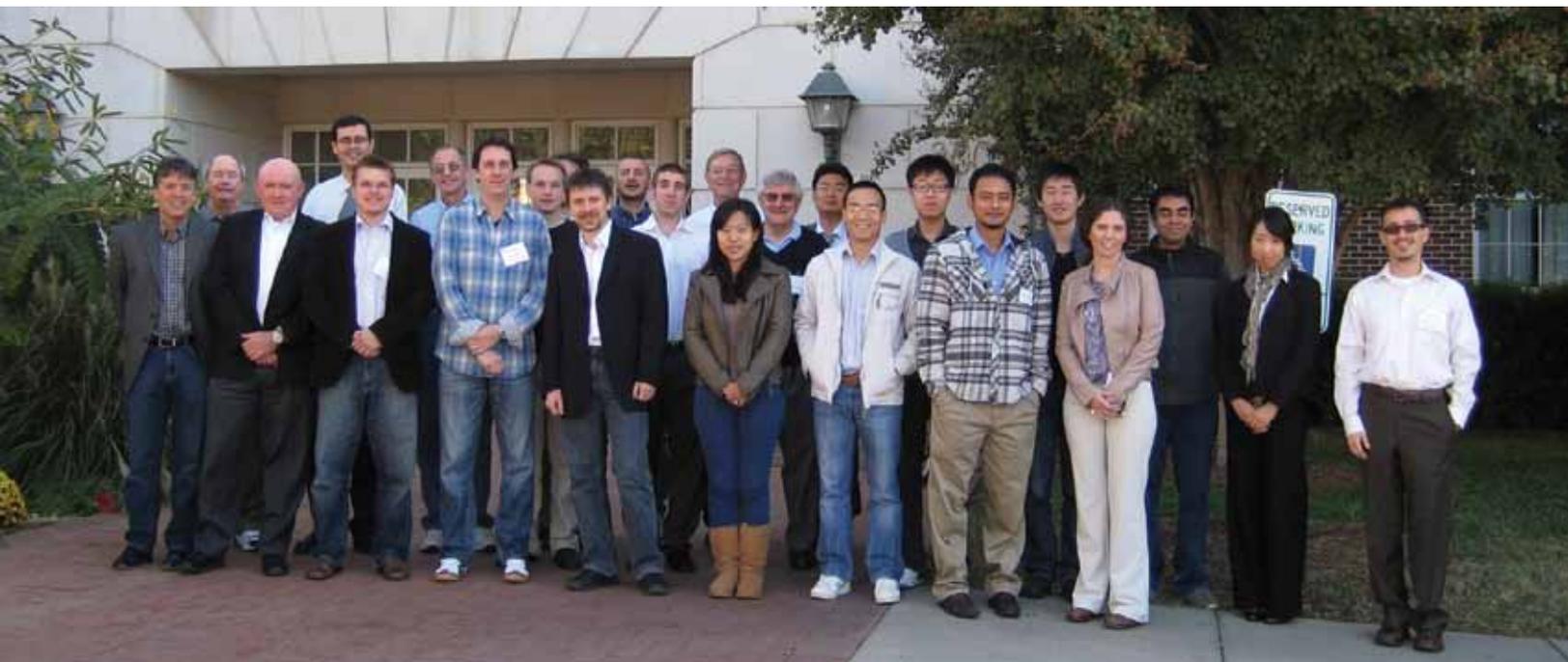
Held Nov. 4–6 on the SMU campus in Dallas, the event was organized by Nathan Balke and Tom Fomby of SMU and Mark Wynne of the Federal Reserve Bank of Dallas. It featured presentations by researchers from the Federal Reserve Banks of Dallas and Kansas City, Chiba Keizai University, the University of Padova, the University of Kiel, the University of California at Irvine and Boston University.

DSGE models have become an essential part of economists' empirical toolkit in recent years.

These models have their origins in the seminal contributions of Kydland and Prescott (1982) and Long and Plosser (1983), which revolutionized empirical macroeconomics.

Early models in what was first known as the “real business cycle” literature were driven by real shocks and did not feature the kinds of frictions that seem essential to understanding the role of monetary policy. Goodfriend and King (1997) and Clarida, Galí and Gertler (1999) showed how the basic real business-cycle framework could be augmented with imperfectly competitive product markets and Calvo price-setting to allow meaningful analysis of monetary policy within this class of general-equilibrium models.

Subsequent work by Christiano, Eichenbaum and Evans (2005) and Smets and Wouters (2007) laid the foundations for these models to become



Attendees at the conference, held on the SMU campus, reviewed progress made in development of DSGE models for monetary policy analysis.



Enrique Martínez-García of the Dallas Fed discusses NOEM models and Bayesian estimation.

the workhorse frameworks for policy analysis in most central banks.

### The Papers

The conference started with a presentation by Enrique Martínez-García on “NOEM Models and Bayesian Estimation: The Challenges that Lie Ahead?” (coauthored with Diego Vilán and Mark Wynne). This paper is part of a long-standing project of Martínez-García and Wynne that seeks to understand the potential role of global slack as a determinant of U.S. inflation dynamics.

In an earlier paper, Martínez-García and Wynne (2010) showed there is analytical content to the so-called global slack hypothesis, at least within the context of the widely used New Keynesian model. However, empirical support for the idea is fragile at best. Simple reduced-form regressions provide some support, but it would be preferable to evaluate the idea by taking a full structural model to the data.

In recent years, Bayesian techniques have become increasingly popular as a means of estimating structural DSGE models. In his presentation, Martínez-García examined how well such techniques estimate key model parameters by using the simple, stripped-down, two-country model in Martínez-García and Wynne (2010) to

generate artificial data and then applying the standard Bayesian techniques to assess how well they recover the (known) structural parameters.

The program’s second paper, “Inflation Rate and Nominal Exchange Rate Volatility Brought About by Optimal Monetary Policy Under Local Currency Pricing,” was presented by Eiji Okano of Chiba Keizai University in Japan. It sought to characterize the nature of optimal monetary policy in a globalized environment when firms engage in local currency pricing. Under producer currency pricing—that is, when firms set prices in the currency of the country in which production occurs—the prices of imported goods fully reflect exchange-rate movements. Under such circumstances, stabilizing domestic (or producer price index) inflation is the optimal monetary policy. However, when firms engage in local currency pricing, the law of one price no longer holds, and Okano showed that it is then optimal for central banks to stabilize consumer price inflation (which is closer to actual central bank practice).

U.S. inflation, as measured by annualized quarterly changes in the gross domestic product deflator, has ranged from lows of less than 1 percent in the late 1990s to highs exceeding 12 percent in the 1970s as the Great Moderation of the 1980s, 1990s and 2000s followed the Great Inflation of the 1960s and 1970s.

In “Fitting U.S. Trend Inflation: A Rolling-Window Approach,” the program’s third paper, Efram Castelnovo of the University of Padova in Italy examined how much of the variation in inflation was due to shocks to the long-run or trend inflation rate post-World War II. Castelnovo, using a closed-economy variant of the standard New Keynesian model Martínez-García and Okano employed in their presentations, decomposes inflation movements into components attributable to cost-push shocks, demand shocks, policy shocks and, finally, shocks to the monetary authority’s inflation target or trend inflation rate. His main finding is that shocks to trend inflation account for a significant

amount of the variation in inflation and the federal funds rate over the period studied.

All models are imperfect approximations of reality, with varying degrees of success in accounting for observed data series. When economists have two alternative models that can account for what is observed in reality, is there a way to choose between them? The fourth paper, “Model Comparison in Market Behaviors: A Formal Test to New Keynesian Three-Equations and Structural Stochastic Volatility Models,” by Tae-Seok Jang of the University of Kiel in Germany, illustrated the model comparison developed by Hnatkovska, Marmer and Tang (2011) to test alternative specifications of the basic New Keynesian model and alternative models of structural stochastic volatility. Jang shows that while the hybrid New Keynesian model (i.e., the model augmented to include price indexation) fits U.S. data better during both the Great Inflation and Great Moderation periods than a purely forward-looking version of the model, the Hnatkovska, Marmer and Tang test finds the differences are not statistically significant.

One of the most important drivers of progress in economic research has been the revolution in computing power over the past two decades. Economists can build ever-more detailed mod-

els that are subsequently evaluated numerically on computers. Many steps in this process have been automated, thanks to the development of sophisticated software packages. However, a crucial first step in many cases is making a model stationary, a step still dependent on old-fashioned pencil-and-paper techniques. In his presentation “(Log) Linear Approximation of Stochastic Growth Models: Why Scratch the Right Ear with the Left Hand?” Martin Fukac of the Federal Reserve Bank of Kansas City (coauthor with Jaromír Beneš of the International Monetary Fund) argued that this initial step is in many cases unnecessary if the model exhibits the balanced growth property.

Fabio Milani of the University of California at Irvine presented “Expectations Formation and Monetary DSGE Models: Beyond the Rational Expectations Paradigm,” coauthored with Ashish Rajbhndari, also of UC-Irvine. The paper explored the consequences of departing from the strong form of the rational expectations hypothesis (wherein economic agents incorporate all available information in forming their expectations and are certain about the model’s structure) in the standard New Keynesian model. Milani showed how allowing for news shocks, learning and using direct measures of expectations from surveys can improve the fit and



Participants heard that new models are needed to explain the financial system’s impact on the real economy and to better define international trade and financial linkages.

forecasting performance of the model.

The final presentation, “Frequency Domain Analysis of Medium Scale DSGE Models with Applications to Smets and Wouters (2007),” by Denis Tkachenko (coauthor with Zhongjun Qu of Boston University) examined the issues of parameter identification, estimation and inference in DSGE models.

In a related paper, Qu and Tkachenko (2010) provide necessary and sufficient conditions for local identification of the parameters of medium-scale DSGE models, and in his presentation, Tkachenko illustrated the method with the widely used and cited Smets–Wouters model. Echoing some of the key points of Martínez-García’s presentation that opened the conference, the paper derived the nonidentification curves for the Smets–Wouters model and showed which parameters must be fixed or calibrated to achieve local identification.

Tkachenko also showed how parameter estimates and impulse-response functions can differ significantly when the model is estimated using data at business-cycle frequencies as opposed to the full spectrum. To the extent that most DSGE models are designed to understand the business cycle, omitting data at low and very high frequencies when estimating the model might be desirable.

### Conclusions

The conference confirmed that New Keynesian DSGE models are useful tools for understanding business fluctuations in closed and open economies and also for thinking about important monetary policy questions. However, the current models have nothing to say about how the financial system impacts the real economy; given the events of the past few years, that must now be a top priority for research. Also, to date, there have been relatively few attempts to develop open-economy versions of these models (Erceg, Guerrieri and Gust 2006 being a notable exception). With globalization defining the environment in which

monetary policy is now made, models that take seriously international trade and financial linkages will be crucial to the policy process.

—Mark Wynne

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