Using DSGE models for monetary policy analysis

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Dynamic stochastic general equilibrium (DSGE) models continue to be widely used for forecasting and policy analysis at central banks and other institutions.[1] Policy institutions need tractable models to predict economic outcomes and analyse different policy scenarios. In addition to being theoretically coherent, such models should fit the data well but also conform with institutional priors such as, for instance, that a higher interest rate will reduce inflation and output (see Linde 2018).

After the financial crisis, benchmark DSGE models failed to explain the causes for the economic downturn as well as the depth of the recession, giving rise to a discussion on macroeconomic modelling and numerous proposals for how to depart from the main paradigms underlying DGSE models. Features that were heavily contested in DSGE models were the reliance on a representative, rational agent, the lack of interaction between agents and the focus on shocks that drive the economy temporarily away from a steady-state equilibrium. To deal with these shortcomings, a completely different modelling approach was called for, focussing on decisions taken by individual – possibly heterogenous – agents, relaxing the assumption of rationality and acknowledging that, although the aggregate system may be in equilibrium, individual components of this aggregate may well be in disequilibrium (Colander et al. 2008).

Despite their known weaknesses and their failure to explain the causes of the 2008 financial crisis, DSGE models still remain the main workhorse for policy analysis in most policy institutions. It might be tempting to explain this with an unwillingness of inertial policy institutions to change the status quo but – at a loser look – DSGE models do have advantages that make them particularly well suited for policy analysis. As argued by Smets et al. (2010), the general equilibrium setup helps telling an economically coherent story about the impact of alternative policy options and the long-run effects of changes in policy regimes. Moreover, by assuming rational expectations, the key role of agents' expectations in adapting to policy changes is spelled out explicitly. Finally, owing to their microfoundations, DSGE models are less subject to the Lucas critique than the large simultaneous equations macroeconomic models of the 1970s and 1980s, which is especially important for analysing effects of different policy actions.[2]

While acknowledging the weaknesses of DSGE models (Gali 2017, Blanchard 2017), policy-oriented research has taken an evolutionary, not a revolutionary, approach to addressing identified shortcomings. In this regard, four main areas for improvement were highlighted (Vines and Wills 2018):

(i) incorporating financial frictions rather than assuming costless financial intermediation;
(ii) relaxing the requirement of rational expectations;
(iii) introducing heterogeneous agents; and

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* The views expressed are those of the author and should not be reported as representing the views of the European Central Bank.

[1] For some examples, see Lindé (2018) or Smets et al. (2010).

[2] Lucas (1976) argued that models need to account for how agents' behaviours will change in reaction to a change in policy. Having a microfounded model that starts from the preferences of an individual and assumes a rational, utility or profit maximising behaviour is a way to address this critique.

(iv) underpinning the model with more appropriate microfoundations.

Considerable progress along these lines has been made. Not surprisingly, work at central banks has concentrated on adding financial frictions to standard DSGE models as this had been an important missing element to understand the consequences of the financial crisis (Christiano et al. 2010, Coenen et al. 2018). At the same time, financial frictions were an essential ingredient to assessing the effects of non-standard monetary policies (Gertler and Karadi 2011). Work has also been done to relax the assumption of rational expectations.[3] By contrast, progress on agent heterogeneity and microfoundations has advanced less. Currently, heterogenous agent models are generally limited to two or at most three different types of agents. Work in these areas still faces challenges in aggregating and evaluating outcomes for different agents, which could be a structural obstacle to devising better microfoundations for macroeconomic models.

Agent-based models with their "bottom-up approach" have been proposed as a possible solution to arrive at a better description and understanding of the economy. On the one hand, they allow for a more realistic modelling of decision problems facing individual decision makers. On the other hand, these models also face problems that hinder their application in macroeconomic policy analysis, as it is not fully clear how to aggregate individual agents' results and tell a consistent story about different policy alternatives. Although nonlinearities that arise in agent-based models may be important features to characterise economic outcomes, such behaviour can be disturbing when analysing different policy options.

Despite new approaches to modelling the macroeconomy, DSGE models remain the main workhorse model in policy institutions today as their features make them well suited for policy analysis. Moreover, efforts have been made to improve some of the known weaknesses. While new approaches not yet have succeeded in replacing DSGE models, the former have been used to complement the latter.[4] Empirical approaches such as Bayesian vector autoregressions, for instance, are used to calibrate parameters of DSGE models or to better fit their impulse responses to the data (see e.g. Assenmacher 2017). Moreover, DSGE models can be linked to microfounded satellite models that focus on specific features (see Aruoba and Schorfheide 2011, Assenmacher et al. 2022), thereby enriching the standard models with new aspects that merit particular analysis.

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[3] An example is the ECB-BASE model (Angelini et al. 2021), which allows for backward-looking and model-consistent expectations.

[4] See Haldane and Turrell (2018) for the use of agent-based models at the Bank of England.

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