Advanced Dynamic Stochastic General Equilibrium (DSGE) Modeling

Objective of the course

This advanced course builds on the foundational concepts introduced in the Introductory DSGE Modelling course and equips participants with rigorous analytical and computational skills required for the specification, estimation, simulation, and policy analysis of DSGE models in real-world macroeconomic environments. The course is designed for policy analysts and researchers in Ministries of Finance, Central Banks, academia, and international organisations engaged in fiscal, monetary, and external sector policy analysis. Participants will gain hands-on experience in deriving and coding DSGE model equations, implementing log-linearization and approximation techniques, incorporating nominal and asset market rigidities, modelling debt dynamics and balance of payments, and estimating DSGE models using Bayesian and Maximum Likelihood approaches. The course further introduces forecasting, variance decomposition, sequential policy scenario design, and robustness analysis to enhance the application of DSGE frameworks in evidence-based macroeconomic policymaking. Delivered through a combination of lectures, guided coding sessions, and practical exercises, the course emphasizes applied learning using advanced DSGE tools in Matlab and Dynare. The training is delivered in a structured, module-based format and is suitable for participants with prior knowledge in DSGE modeling, macroeconomics and quantitative methods. The course is delivered in five modules as follows.

- **Module 1: Advanced Theoretical Foundations and Model Derivation**
  - Derivation of the First Order Conditions (F.O.C) for DSGE models
  - Linearization of F.O.C
  - Log-linearization and approximation techniques
  - Nominal rigidities and Calvo price setting
  - Divine coincidence in DSGE models
- **Module 2: Hands-on DSGE Coding and Structural Extensions**
  - Coding DSGE model equations in Dynare using MATLAB
  - Labour Market Rigidities in DSGE models
  - Asset market rigidities in DSGE models
  - Inertia in the New Keynesian framework (theory and model code)
  - Appending inertia to linearized DSGE equations
  - Incorporating annualized inflation rate in DSGE models
  - Government sector modelling (fiscal and monetary policy)
  - Integration of debt dynamics in DSGE frameworks
  - Incorporation of Balance of Payments in DSGE models
  - Capital flows in open economy DSGE models
  - Designing sequential policy scenarios and shock analysis
- **Module 3: Hands-on Estimation of DSGE Models in Matlab and Dynare**
  - Introduction to Bayesian estimation approaches
  - Estimation of DSGE models: Bayesian vs Maximum Likelihood
  - Likelihood functions in DSGE models
  - Kalman Filter and state-space representation
  - Priors and posterior distributions coding and interpretation

- Bayesian estimation using Markov Chain Monte Carlo (MCMC)
- Metropolis-Hastings (MH-MCMC) algorithms

- **Module 4: Forecasting and Policy Analysis using DSGE Models**
  - Forecasting in DSGE models
  - Variance decomposition and interpretation
  - Impulse response functions under estimated models
  - Sacrifice ratios computation in DSGE frameworks
  - Welfare simulations and policy trade-offs in DSGE model codes
  - Building sequential policy simulations scenario in Matlab and reporting of results
- **Module 5: Model Evaluation, Limitations and Robustness**
  - Model limitations in DSGE frameworks
  - Sensitivity analysis and robustness checks
  - Model validation techniques
  - Debugging DSGE Models in Matlab and Dynare
  - Interpretation of DSGE simulation results
  - Reporting formats for macroeconomic policy analysis

This advanced modular structure enables participants to transition from calibrated DSGE frameworks to fully estimated models capable of supporting fiscal, monetary, and external sector policy analysis, forecasting, and scenario-based decision-making in dynamic macroeconomic environments.

Mode of delivery

The course is delivered through an intensive, hands-on approach in which participants systematically build the Advanced DSGE model, over the duration of the training. The programme is highly sequential, requiring full attendance at all sessions, as each step builds directly on the previous one. Participants work in teams to enhance peer learning and methodological coherence, while each participant is required to have an individual laptop and mouse for practical implementation. By the end of the course, each team presents policy simulation results generated from their model. For the online delivery option, participants are required to submit all assignments within the stipulated timelines to ensure completion within the scheduled period, as extensions may incur additional facilitation costs. To apply for this course, fill in the form below or send an email to apply@macrosolve.net or macrosolveinfo@gmail.com.