Lecture 2: Development of DSGE Models

Lei Pan

School of Accounting, Economics and Finance
Curtin University

Outline

- Introduction to history of DSGE
- Recently advance of DSGE
- DSGE models employed by some central banks

Critiques on Structural Models

- Lucas critique (Lucas, 1976)
  - it is naive to try to predict the effects of a change in economic policy entirely on the basis of relationships observed in historical data
  - especially highly aggregated historical data
- Sims critiques
  - too much identification constraints are imposed which seems to be incredible
- Lack of microeconomic foundations

RBC Models

- Kydland and Prescott (1982) *Econometrica* paper
  - US Data: 1954Q1-1982Q4
  - Simulation data in most dimensions are consistent with real data. (e.g., output, consumption)
  - Fluctuation of economy is overall result of the optimal response of individual to the exogenous real shock, such as technology shocks.

Key Takeaways for RBC Model

- Individual utility maximization
- Rational expectations
- Flexible price
- Competitive market, market can clear out automatically
- Microeconomic foundations

New Keynesian Models (1 of 2)

- Borrow some assumptions from RBC models
  - rational expectation
  - microeconomic foundations
- Give up some assumptions
  - flexible price: sticky price (e.g., menu cost)
  - perfect competition: monopolistic competition

New Keynesian Models (2 of 2)

- NK models use many other market imperfection to explain the fluctuations of economy.
  - uncertainty and risk
  - information asymmetry (imperfection)

NK and DSGE Models

- In general, we take both RBC and NK models as DSGE models because they have the basic characteristics of DSGE models.
  - **Dynamic**: $t-1$, t, $t+1$; inter-temporal maximization problems
  - **Stochastic**: rational expectation and exogenous shocks that drive the model
  - **General equilibrium**: markets are at equilibrium and clear out (i.e., demand $=$ supply)

Christiano *et al.* (2005)

- Christiano *et al.* (2005) *Journal of Political Economy* paper
  - A lot of Key features are developed in this paper which are one of the highest referenced papers in the literature.

Key Takeaways for Christiano *et al.* (2005)

- Variable utilization rate of capital: improves the amplification mechanism of the RBC model.
- Habit formation (to better utilize data for consumption).
- Working capital loan mechanism.
- Adjustment cost of investment
  - too much deviation of current investment from last period will cost a lot
- Nominal rigidities (e.g., price and wage).

DSGE Model (1 of 2)

- Many DSGE models emerges that are used in almost every fields of macroeconomics.
- A lot of new features and sectors are introduced into the models.
  - import and export sector
  - financial intermediates (e.g., banks)
  - foreign countries: small open economy
  - Two-country and three-country models
  - Trade sector and nontrade sector

DSGE Model (2 of 2)

- More features
  - Stochastic volatility: volatility of shocks are not constant any more
  - Financial accelerator
  - Labour frictions
  - Incomplete financial markets
  - Incomplete exchange rate pass-through
  - Different price assumptions (price to market, PTM)

New Open Economy Macroeconomics (NOEM)

- Obstfeld and Rogoff (1995) *Journal of Political Economy* paper
  - develops an analytically tractable two-country model
  - based on monopolistic competition and sticky nominal prices
  - offers simple and intuitive predictions about exchange rates and current accounts
  - sometimes differ sharply from those of either modern flexible-price inter-temporal models or traditional sticky-price Keynesian models

Central Banks' DSGE Models

European Central Bank	New Area Wide Model (NAWN)
US Fed	SIGMA
IMF	GEM,GFM,GIMF
Bank of England	BEQM
Central bank of Chile	MAS
Sveriges Riksbank	RAMSES
Central bank of Peru	MEGA-D
Norges Bank	NEMO

Summary

- Structural model $\rightarrow$ RBC model $\rightarrow$ NK model $\rightarrow$ DSGE model $\rightarrow$ NOEM $\rightarrow$ More complex model
- You could easily find DSGE model are widely used in every fields of macroeconomics.