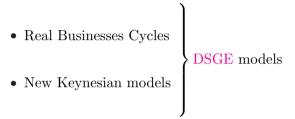
# A Course on DSGE Models with Financial Frictions Part 2: The New-Keynesian Model

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March 19, 2021

### Summary



- Dynamic Stochastic General Equilibrium
- RBC & NK (plain vanilla) models assume perfect financial markets
  - $\rightarrow$  DSGE models with financial frictions go a step further

# Summary

- DSGE models are micro-founded
- They make assumptions regarding:
  - (1) Preferences (log utility, CRRA, GHH...)
  - (2) Technology (Cobb Douglas PF, CES...)
  - (3) Market structure (Complete-incomplete markets, heterogeneity, FF...)

# Background Literature

- Seminal RBC models: Kydland and Prescott (1982) & Long Jr and Plosser (1983)
- New Keynesian main textbooks:
  - Galí (2015) Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian framework and Its Applications, Second Edition. Princeton University Press
  - Woodford (2011) Interest and Prices. Foundations of a Theory of Monetary Policy. Princeton University Press
- General DSGE
  - Miao (2020) Economic Dynamics in Discrete Time. MIT press
- State of the art multi-shock and frictions NK-DSGE model: Smets and Wouters (2007)

#### RBC to NK to FF DSGE

- RBC: Neoclassical model where agents optimize with rational expectations
- New Keynesian environment adds price and/ or wage stickiness
- Financial frictions eliminate complete markets
  - Sometimes these frictions are very specific, derived from micro-founded behaviour, while sometimes they are more ad-hoc (reduced form)

#### Models' Solution

- What characterizes the solution of a DSGE model?
  - The optimality conditions obtained through the various maximizations
  - Constraints
  - Shock Processes
- The steady state is obtained by transforming all equations from dynamic to static

### Models' Solution

- What is the solution of a DSGE model?
  - A set of policy functions
- A simple RBC model example
  - $C_t = g_c(K_t, Z_t)$
  - $\bullet \ K_t = g_k(K_{t-1}, Z_t)$
- Finding the policy function can be a very difficult problem: there is rarely an analytical solution and we therefore use numerical techniques
- The general idea is to approximate the policy function with a polynomial  $\hat{g}_c(K_t, Z_t) = g_c(K_t, Z_t)$ :
  - $\hat{g}_c(K_t, Z_t) = \alpha_c + \alpha_{c,k} K_t + \alpha_{c,z} Z_t$

### Solution Methods

- A large number of solution methods have been proposed to solve DSGE models
  - See Fernández-Villaverde et al. (2016) for an almost complete characterization
- Perturbation algorithms build Taylor series approximations to the solution of a DSGE model around its deterministic steady state
  - This is what Dynare does
  - We will focus on this
- Projection methods handle DSGE models by building a function indexed by some coefficients that approximately solves our set of functions
  - The coefficients are selected to minimize a residual function that evaluates how far away the solution is from generating a zero
  - Example: Parametrized Expectations Algorithm by: Den Haan and Marcet (1990)
- Value function iterations

- Den Haan, W. J. and Marcet, A. (1990). Solving the stochastic growth model by parameterizing expectations. *Journal of Business & Economic Statistics*, **8**(1), 31–34.
- Fernández-Villaverde, J., Rubio-Ramírez, J. F., and Schorfheide, F. (2016). Solution and estimation methods for dsge models. In *Handbook of macroeconomics*, volume 2, pages 527–724. Elsevier.
- Galí, J. (2015). Monetary policy, inflation, and the business cycle: an introduction to the new Keynesian framework and its applications. Princeton University Press.
- Kydland, F. E. and Prescott, E. C. (1982). Time to build and aggregate fluctuations. *Econometrica*, pages 1345–1370.
- Long Jr, J. B. and Plosser, C. I. (1983). Real business cycles. *Journal of Political Economy*, **91**(1), 39–69.
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