

A Course on DSGE Models with Financial Frictions

Part 1: Introduction

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March 17, 2021

Summary

- Real Businesses Cycles
 - New Keynesian models
 - Dynamic Stochastic General Equilibrium
- } DSGE models
- RBC & NK (plain vanilla) models assume perfect financial markets
→ 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
 - $C_t = g_c(K_t, Z_t)$
 - $K_t = g_k(K_{t-1}, Z_t)$
- 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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