A Course on DSGE Models with Financial Frictions Part 1: Introduction

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About The Course (and myself)

- Stelios Tsiaras, email at stylianos.tsiaras@eui.eu
- Working on macro-finance, unconventional monetary policy, macroprudential policy
- Feel free to ask me anything on research!

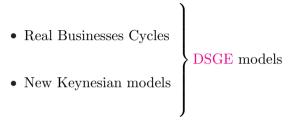
The Course

- An introduction to the main financial frictions DSGE models
- Together with models of simple heterogeneity
- And a short view on models with unconventional monetary policy and macroprudential policy
- Usually, if you have the FF set-up, everything else adds up easily

Overview

- This lecture: Introduction on DSGE models, solution techniques, RBC refresher and how to solve models in Dynare
- Lecture 2: Models with asymmetric information: Essentially the Bernanke et al. (1999)
- Lecture 3: Models with moral hazard problems: Essentially the Gertler and Kiyotaki (2010); Gertler and Karadi (2011)
- Lecture 4: Models with simple form of heterogeneity: Bilbiie (2008), Mankiw (2000)
- Lecture 5: Models with unconventional MP and macroprudential policy (building on the previous blocks)

DSGE models



- 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)
- Next: From the model set up to the model solution

Models' Solution

- What characterizes the solution of a DSGE model?
 - The optimality conditions obtained through the various maximizations
 - The constraints
 - The shock processes
- The steady state equilibrium
- \bullet 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

$$\hat{g_c}(K_t, Z_t) \approx g_c(K_t, Z_t)$$

where

$$\hat{g}_c(K_t, Z_t) = \alpha_c + \alpha_{c,k} K_t + \alpha_{c,z} Z_t$$

[here a first order polynomial approximation]

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, $g(x_t) \approx g(\bar{x}) + (x_t \bar{x})g'(\bar{x}) + \frac{1}{2}(x_t \bar{x})^2 g''(\bar{x})...$
 - 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 residual
 - Example: Parametrized Expectations Algorithm by: Den Haan and Marcet (1990)
- Value function iterations

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