HETEROGENEITY IN QUANTITATIVE MACROECONOMICS

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1. Basic Information about the Course

Course Website:	http://www.syleetim.net/gradmacro/gradmacro.htm
Instructor:	Tim Lee, email: sylee.tim@tse-fr.eu
Time:	Tues 14:00-17:00
Dates:	Sep 12,19,26 / Oct 3,10,17,24 / Nov 7,14,28 / Dec 5
Location:	TBD
Prerequisites:	first year core graduate macro, basic numerical methods

I may be out of town on Nov 14, in which case the last course will be on Dec 5. The website contains course material, and will become more organized as the lecture dates approach.

2. Course Description

We will first review the standard incomplete markets models, which can be quick or slow depending average prior knowledge in the class. We will then cover: i) the standard model in continuous time, ii) models with entrepreneurs/managers, iii) general models of sorting, and iv) models with human capital.

The incomplete markets model will lay out the groundwork for numerical work. We will discuss both the theoretical results behind the standard incomplete markets model and also methods used to numerically solve it. As we move on toward more applied models, we will briefly discuss calibration and heterogeneous agent modeling, at which point we will start talking more about data.

The part on continuous time will be mostly analytical with some discussion of why it may be preferred numerically. This module is mainly dealt with just to make sure you are exposed to some of the basic tools you may need when you read some papers, but continuous time models are not the norm in macro.

Occupational choice and misallocation, as well as sorting and two-sided matching, are old topics but has been gaining renewed focus in recent years. We will focus on the theoretical aspects of these models, and review how they have been applied empirically. The human capital topic will cover Roy selection, Becker/Ben-Porath style lifecycle accumulation, and the Becker/Tomes/Loury intergenerational model. Here we will focus less on the theory and more on empirical/quantitative applications and recent developments.

Throughout the course, I will emphasize the most significant models, how they might be numerically implemented, and their contribution to the literature. Since this is a lecture, more emphasis will be put on how the theory works and intuition. But due to the nature of the papers being studied, I will be mentioning computer algorithms quite often. If time permits, we may also discuss how to implement specific algorithms which may not be obvious to figure out on your own. However, this is NOT a numerical course, which will be offered in the next semester. Individual questions about coding and your own research are welcome, but will not be dealt with specifically in the lectures.

I hope the course becomes a venue where we can learn together and get to know each other. Feel free to recommend something else you would like to talk about, and also to correct anything I say in lecture that sounds wrong/you disagree with.

Objectives and Goals By the end of the course, you should be able to understand most variants of the standard incomplete models and how to implement them. You should also be able to start your own project on related topics (should you choose to do so). The ability to do so should be apparent in the final project (more on this below).

3. Assignments

There are no assignments except for a term project, which must be submitted by the end of the last day of the semester (Dec 16). The term project will consist of two parts: a summary/critique of a paper(s) (something like a referee report or detailed literature review) and a research proposal. The summary should be of a paper(s) that will form the basis of your proposal, and should be at least 2 full pages but no longer than 5 pages.

For the proposal, you must clarify how your idea is related but distinct from the previous literature that you summarize in the critique. You can work on the assignment either by yourself or as part of a team, but teams may not be larger than 2 people. Teams are also expected to do a bit more than if you were to work alone. As much as possible, I recommend you work in teams.

1. Summarize any paper(s), at least one of which has been published after the year 2000 (this includes unpublished working papers), that uses an incomplete market model. Get my consent by Oct 15.

2. Replicate—and if possible, extend—the paper(s). Extensions can either be additional empirical work or numerical implementations. You do not have to replicate entire paper, just the benchmark results. Ask me if it is unclear how much you need to replicate. Then, provide at least one example of how your idea improves upon the older one. You do not need to have new, full-blown results, just an indication of how your idea works. Conclude with how you plan to complete the project.

The idea is that you can continue to work on the project so that it is a chapter in your dissertation, and something you can present with full results in the spring semester.

For coding, I'd recommend Fortran, Julia, Python, or C (in order of popularity in quantitative macro).[1] The numerical course in the next semester will mostly be based on Fortran (by

[1] Julia is catching up fast, but I have never used it myself.

me) and C (by Sumudu). Of course Matlab is the most popular language, which you are free to use. But it is the least generalizable language (that is, it is a very high-level, commercial language) and not the best for learning, and will not be used in the numerical course. Of course, you will not be penalized for using it in the course though.

4. Textbooks

The goal of this course is to review the line of literature up to the most recent frontier in research, and also touch on different ways the model can be implemented. For most of the course, I will use self-made notes and slides (also posted on the website), since there is no such textbook that exactly fits this criteria. But the following are good references (and you may already have them):

- ***Advanced Macroeconomic Theory***, (Any) ed., L. Ljungqvist and T.J. Sarget, Norton, W.W. & Company, Inc., 2004.
- ***Numerical Methods in Economics***, 2nd ed., Kenneth Judd, Pearson Addison Wesley, 2008.
- ***Dynamic General Equilibrium Modeling***, 2nd ed., Burkhard Heer and Alfred Maussner, Springer, 2009.

5. Outline of the Course

The following is an approximate lecture plan along with the relevant reference papers. There is no way we cover all these papers, but we can discuss these or any other papers if the demand arises. Underlined are the ones I think are more important; it may be interesting and/or beneficial to take a look at them.

Savings and Incomplete Markets

(Pre) Arrow-Debreu and Arrow Securities: Ljungqvist and Sargent (2004) Chapters 8,12,13. We won't go through this in class but I expect you to know them.

Sep 12 Savings problem and incomplete Markets: Ljungqvist and Sargent (2004) Chapters 16,17; Heer and Maussner (2009) Chapter 7; Huggett (1993); Aiyagari (1994); Zhang (1997); Chamberlain and Wilson (2000).

- Steady-State to Steady-State Transitions: Heer and Maussner (2009) Chapter 8.2; Ríos-Rull (1999); Krueger and Perri (2006); Krebs, Kuhn and Wright (2012).

Sep 19 Aggregate Uncertainy: Heer and Maussner (2009) Chapter 8.3; Krusell and Smith (1998); Castañeda, Díaz-Giménez and Ríos-Rull (1998); Den Haan and Rendahl (2010).

etc. Kehoe and Levine (1993); Alvarez and Jermann (2000); Kehoe and Levine (2001).

Calibration and Data: Read at Home

1. Methodological Issues: Kydland and Prescott (1996); Hansen and Heckman (1996); Sims (1996).
2. Understanding (U.S.) Inequality: Quadrini (1999); Piketty and Saez (2003) Hendricks (2007b); Cagetti and De Nardi (2008); Heathcote, Storesletten and Violante (2009); Guvenen (2011); Acemoglu and Autor (2011); Chetty, Hendren, Kline and Saez (2014); Guvenen, Karahan, Ozkan and Song (2015).
3. "Big" calibrated models: Castañeda, Díaz-Giménez and Ríos-Rull (2003); Heathcote, Storesletten and Violante (2010, 2012).

c.f. (U.S.) Data Sets: `https://www.sas.upenn.edu/~vr0j/`

Top Concentration and Investment Risk

Sep 26 Empirics: Piketty and Saez (2003, 2007); Saez and Zucman (2016).

- Investment risk: Merton (1969, 1971, 1973); Angeletos (2007); Benhabib, Bisin and Zhu (2014); Achdou, Han, Lasry, Lions and Moll (2015).

Digression on Continuous Time Methods

Oct 3 Refresher: HJB equation with no uncertainty and Stochastic Calculus refresher

Oct 10 Stochastic HJB equation and Fokker-Planck

- Labor and investment risk in continuous time (Achdou et al., 2015).

Occupational Choice, Financial Frictions and Misallocation

Oct 17 Occupational Choice and Financial Frictions: Lucas (1988); Garicano and Rossi-Hansberg (2006); Buera (2009); Buera, Kaboski and Shin (2011); Moll (2011); Buera and Shin (2013); Midrigan and Xu (2013).

- Inequality: Quadrini (2000); Cagetti and De Nardi (2006).

Oct 24 Assignment Models: Sattinger (1979); Holmes and Schmitz (1990); Sattinger (1993); Holmes and Schmitz (1995); Gabaix and Landier (2008); Tervio (2008); Costinot and Vogel (2010).

- Misallocation: Hsieh and Klenow (2007); Restuccia and Rogerson (2008); Guner, Ventura and Yi (2008); Hsieh and Klenow (2009); Restuccia and Rogerson (2013).

Intro to Human Capital and Roy Model

Nov 7 Human Capital and Growth: Lucas (1988); Galor and Zeira (1993), Benabou (1996); Durlauf (1996); Krebs (2003); Erosa, Koreshkova and Restuccia (2010); Manuelli and Seshadri (2014).

- Roy Model and the College Premium:

  (a) Models: Roy (1951); Heckman and Honoré (1990); French and Taber (2011).

  (b) Empirics: Katz and Murphy (1992); Altonji (1993); Taber (2001); Goldin and Katz (2007); Carneiro and Lee (2011); Altonji, Bharadwaj and Lange (2012); Zimmerman (2014).

Life-cycle Inequality, and Intergenerational Mobility

Nov 14 Lifecycle Accumulation: Becker (1962); Ben-Porath (1967); Eaton and Rosen (1980); Heckman, Lochner and Taber (1998).

- Variance or Volatility?

  (a) Models: Huggett, Ventura and Yaron (2006); Guvenen (2007); Huggett, Ventura and Yaron (2011); Belzil, Hansen and Liu (2012).

  (b) Empirics: Taber (2001); Cunha, Heckman and Navarro (2005); Chen (2008); Lemieux (2010).

Nov 28 Intergenerational Persistence:

  (a) Models: Becker and Tomes (1979); Loury (1981); Becker and Tomes (1986); Solon (2004).

  (b) Empirics: Goldberger (1989); Solon (1992); Zimmerman (1992); Mulligan (1999); Han and Mulligan (2001); Plug and Vijverberg (2003); Black, Devereux and Salvanes (2005); Black and Devereux (2011); Chetty et al. (2014).

- Quantitative models of Intergenerational Mobility: Restuccia and Urrutia (2004); Cunha and Heckman (2007); Cunha, Heckman and Schennach (2010); Hendricks (2007a); Manuelli and Seshadri (2009); Holter (2012).

Dec 5 Buffer time

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