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Overview: This is a graduate course in the second year macroeconomics field. We will first cover some tools, namely continuous time methods that are useful for macroeconomics. These include Hamiltonians, Stochastic Calculus, Hamilton-Jacobi-Bellman equations, and Kolmogorov Forward Equations. Rather than presenting an in-depth technical derivation of the methods from first principles, my aim is to provide you with a “cookbook” for you to use these methods in your own research and then to cover a few applications. We will then cover some stochastic models that generate growth in individual firm productivity, firm size, individual income and wealth, CEO pay and many other variables of economic interest. These are models that have implications for cross-sectional data and for time series behavior of an economy as a whole. Some of these will rely on the continuous time methods we developed in the first part of the course.

Organization: The class meets on Tuesdays and Thursdays from 1:00 to 2:30pm. A preliminary syllabus is attached. I will add papers throughout the course.

Grading: Your course grade will be based on one or two problem sets and a written project due on January 25. Your choice of paper should be consistent with your interests. The written project should be on an original research idea, necessarily related to the course’s topics (including Guido’s part). Descriptions or reviews of the literature are acceptable but not as ambitious. In any case, your idea should be expressed in the context of the relevant literature. Only one idea per project, please!

1. Deterministic Continuous Time Methods

1.A Methods:

Lecture Notes: Hamiltonians and Phase Diagrams

Acemoglu (2010), Chapter 7 “Review of the Theory of Optimal Control” in “Introduction to Modern Economic Growth”

1.B Applications:

Lecture Notes: Neoclassical Growth Model in Continuous Time

Acemoglu (2010), Chapter 8 “The Neoclassical Growth Model” in “Introduction to Modern Economic Growth”

Lecture Notes: “An Exact New Keynesian Model in Continuous Time”

Werning (2012), “Managing a Liquidity Trap”, Working Paper

Additional readings on liquidity traps and fiscal multipliers in New Keynesian models:

Christiano, Eichenbaum and Rebelo (2011), “When Is the Government Spending Multiplier Large?,” Journal of Political Economy

Fernandez-Villaverde, Gordon, Guerron and Rubio-Ramirez (2012), “Nonlinear Adventures at the Zero Lower Bound”, Working Paper

Woodford (2011), "Simple Analytics of the Government Expenditure Multiplier," American Economic Journal: Macroeconomics

2. Stochastic Continuous Time Methods

2.A Methods:

Lecture Notes: Stochastic Calculus, Hamilton-Jacobi-Bellman Equations, Kolmogorov Forward Equations, Finite Difference Methods

Candler (1999), "Finite-Difference Methods for Dynamic Programming Problems." In Computational Methods for the Study of Dynamic Economies., ed. Ramon Marimon and Andrew Scott. Cambridge, England: Cambridge University Press.

Dixit (1993), "The Art of Smooth Pasting" Fundamentals of Pure and Applied Economics 55, The Routledge.

Dixit and Pindyck (1994), "Investment Under Uncertainty," Princeton University Press.

Kushner (1990), "Numerical Methods for Stochastic Control Problems in Continuous Time", SIAM Journal on Control and Optimization

Kushner and Dupuis (1992), "Numerical Methods for Stochastic Control Problems in Continuous Time", Springer New York

Miranda and Fackler (2002), "Applied Computation Economics and Finance", MIT Press

2.B Applications:

Gabaix (2009), "Power Laws in Economics and Finance", Annual Review of Economics

Merton (1975), "An Asymptotic Theory of Growth Under Uncertainty", Review of Economic Studies

Stokey (2008), Chapter 6 "Exercising an Option" from "The Economics of Inaction: Stochastic Control Models with Fixed Costs"

Additional readings on the implications of financial frictions for business cycle fluctuations:

Adrian and Boyarchenko (2012), "Intermediary Leverage Cycles and Financial Stability", Working Paper

Brunnermeier and Sannikov (2012), "A Macroeconomic Model with a Financial Sector", Working Paper

He and Krishnamurty (2012), "A Macroeconomic Framework for Quantifying Systemic Risk", Working Paper

Haddad (2012), "Concentrated Ownership and Equilibrium Asset Prices", Working Paper

3. Stochastic Models of Distribution and Growth in Macroeconomics

3.A Prerequisites (Not Taught)

Aiyagari (1994), "Uninsured Idiosyncratic Risk and Aggregate Saving" The Quarterly Journal of Economics

Krusell and Smith (1998). "Income and Wealth Heterogeneity in the Macroeconomy," Journal of Political Economy

Den Haan (2010), "Assessing the Accuracy of the Aggregate Law of Motion in Models with Heterogeneous Agents", Journal of Economic Dynamics and Control

Rios-Rull (1997), "Computation of Equilibria in Heterogeneous Agent Models," Minneapolis Fed Staff Report

3.B Income and Wealth Distribution

Atkinson, Piketty, and Saez (2011), "Top Incomes in the Long Run of History," Journal of Economic Literature

Benhabib, Bisin and Zhu (2011), "The distribution of wealth and fiscal policy in economies with finitely lived agents" Econometrica

Benhabib, Bisin and Zhu (2012), " The distribution of wealth in the Blanchard-Yaari model", Working Paper

Cagetti and DeNardi (2006), "Entrepreneurship, Frictions, and Wealth," Journal of Political Economy

Lucas and Moll (2012), "Knowledge Growth and the Allocation of Time", Working Paper

Additional readings on income and wealth distribution:

Acemoglu (2002), "Technical Change, Inequality, and the Labor Market," Journal of Economic Literature

Huggett, Ventura and Yaron (2011), "Sources of Lifetime Inequality," American Economic Review

Katz and Murphy (1992), "Changes in Relative Wages, 1963-87: Supply and Demand Factors," Quarterly Journal of Economics

Krueger, Perri, Pistaferri and Violante (2010), "Cross-Sectional Facts for Macroeconomists", Review of Economic Dynamics. This is a special issue, also see other papers: <http://www.economicdynamics.org/RED-cross-sectional-facts.htm>

Moll (2012), "Inequality and Financial Development: A Power-Law Kuznets Curve," Note

Quadrini (1999): "The Importance of Entrepreneurship for Wealth Concentration and Mobility," Review of Income and Wealth

Quadrini (2000), "Entrepreneurship, Saving and Social Mobility," Review of Economics Dynamics

3.C Firm Size and Productivity Distribution

Carvalho and Gabaix (2012), "The Great Diversification and its Undoing", American Economic Review

Gabaix, Xavier (2011), "The Granular Origins of Aggregate Fluctuations." Econometrica

Luttmer (2007), "Selection, Growth, and the Size Distribution of Firms," Quarterly Journal of Economics

Luttmer (2012), "Slow Convergence in Economies with Firm Heterogeneity," Working Paper

Additional readings on firm heterogeneity

Bertola and Caballero (1994), "Irreversibility and Aggregate Investment"

Caballero, Engel and Haltiwanger (1995), "Plant-level adjustment and aggregate investment dynamics",
Brookings Papers on Economic Activity

Caballero and Engel (1999), "Explaining Investment Dynamics in U.S. Manufacturing: A Generalized (S,s)
Approach", *Econometrica*

Bachmann, Caballero and Engel (2011), "Aggregate Implications of Lumpy Investment: New Evidence
and a DSGE Model", Working Paper

Khan and Thomas (2008), "Idiosyncratic shocks and the role of nonconvexities in plant and aggregate
investment dynamics" *Econometrica*

Jones (2005), "The Shape of Production Functions and the Direction of Technical Change," *Quarterly
Journal of Economics*

Rossi-Hansberg and Wright (2007), "Establishment Size Dynamics in the Aggregate Economy", *American
Economic Review*

3.D Other

Alvarez and Shimer (2011), "Search and Rest Unemployment", *Econometrica*

Alvarez and Shimer (2012), "Human Capital and Unemployment", Working Paper

Gabaix and Landier (2008), "Why Has CEO Pay Increased So Much?" *Quarterly Journal of Economics*

Sattinger (1993), "Assignment Models of the Distribution of Earnings," *Journal of Economic Literature*