

Topics in Macroeconomics B

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UC3M

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Dates. TBA.

Objective. This course will focus on continuous time models of distribution and growth. The course will review the numerical methods use to compute models in modern macro with heterogeneous agents (such as steady state and transition paths in the Aiyagari-Hugget-Model, models of entrepreneurship, models with risky and safe assets, models with transaction costs, models with fixed costs, model of firm dynamics, dynamic games in macro models). We will also review important analytical results that will help us understand the theory and the numerical methods employed. In sum, the student will learn about important research questions in the most fertile areas in macroeconomics and will become familiar with frontier quantitative techniques used in macroeconomics,

Textbooks. The course will use material from the books by Stokey (2008) and Dixit (1993). It will also draw on lecture notes from Matthias Kredler's website (UC3M) and computer codes in the website of Benjamin Moll.

- Dixit, Avinash (1993). *The Art of Smooth Pasting*, Princeton University Press, Princeton, N.J..
- Stokey, Nancy (2009). *The Economics of Inaction*, Princeton University Press, Princeton, N.J.
- Matthias Kredler's Website: <http://www.eco.uc3m.es/mkredler/Teaching.html>
- Benjamin Moll's Website: <http://www.princeton.edu/7Emoll/HACTproject.htm>

Grading. The final grade of the course will be based on:

1. Homework assignments (30%)
2. Final Exam (70%).

Part I. Income and Wealth Distribution in Macroeconomics.

1. The workhorse model: Bewley (1986), Hugget (1993) and Aiyagari (1994)
2. Analytical Results: Consumption, saving, and inequality (Achdou et. al. 2017)
3. Numerical Methods (based on notes by Moll and Kredler):
 - (a) Solving HJB equation: Implicit and Explicit methods.
 - (b) Solving Kolmogorov Forward Equation
 - (c) Transitional Dynamics
4. Continuous stochastic processes
 - (a) Difussions (Chapter 5 from Stokey, appendix in Barcyk and Kredler (2014), Dixit (1993).
 - (b) Ito's Lemma
 - (c) HJB and KFE equations
 - (d) Computation
 - (e) Some theoretical results on diffusions
5. Other theories of income and wealth inequality: Piketty and Zucman (2013), Bisin and Zhu (2013), lecture 6 by Moll.

Part II. Growth Theory in Continuous Time.

1. HJB and KFE equations (notes from Kredler's website)
2. Computation
3. Entrepreneurship (Buera and Shin, 2013) and non-convex model of growth (Skiba, 1978)
4. Power Laws (Gabbaix 2009)

Part III. Stopping Time Problems.

1. Exercising an option (Stokey 2008, chapter 6)
2. The problem of a firm
3. Present values (Dixit 1993)

4. Housing and portfolio choice (Stokey 2008, chapter 9)
5. Investment with linear and convex adjustment costs (Stokey 2008, chapters 10 and 11)

Part IV. Firm Dynamics.

1. Entry, imitation, and exit by firms (Luttmer 2007, lecture notes by Moll)
2. Schumpeterian growth (lecture notes by Chris Edmond).
3. Models of innovation (Klette and Kortum 2004, Lentz and Mortensen 2005 and 2008, Perla and Tonetti 2014)
4. Industrial revolution (Atkeson and Kehoe 2007)
5. Labor market frictions (Bentolila and Bertola 1990).

Part V. Strategic Behavior in Continuous Time.

1. Altruism (Barcyak and Kredler (2014))
2. Elderly care (Barcyak and Kredler (2017))
3. Sovereign debt (Aguiar, Amador, Farhi, Gopinath (2013))

References

- Aguiar, M., M. Amador, E. Farhi, and G. Gopinath (2013). “Crisis and commitment: Inflation credibility and the vulnerability to sovereign debt crises.” *NBER Working Paper 19516*.
- Aiyagari, S. R. (1994). “Uninsurable idiosyncratic risk and aggregate savigng.” *The Quarterly Journal of Economics*.
- Atkeson, A. and P. Kehoe (2007). “Modelling the transition to a new economy: Lessons from two technological revolutions.” *American Economic Review*.
- Achdou, Y., J.M. Lasry, P.L. Lions, and B. Moll (2017), “Heterogeneous agent models in continuous time.” *Princeton University Working Paper*.
- Barczyk, D. and M. Kredler (2014). “Altruistically motivated transfers under uncertainty. ” *Quantitative Economics*.
- Barczyk, D. and M. Kredler (2017). “Evaluating long term care policy options: Taking the family seriously”. *Review of Economic Studies*.

- Bentolila, S. and G. Bertola (1990). “Firing costs and labour demand: How bad is Eusclerosis”. *Review of Economic Studies*,
- Bewley, T. (1986). “Stationary monetary equilibrium with a continuum of independently fluctuating consumers”, in *Contributions to Mathematical Economics in Honor of Gerard Debreu*, ed. by W. Hildenbrand and A. Mas-Colell. North-Holland, Amsterdam.
- Benhabib, Bisin and Zhu (2013) “The wealth distribution in Bewley models with investment risk.” *Working Paper*.
- Buera, F. J. and Y. Shin (2013). “Financial frictions and the persistence of history: A quantitative exploration”. *Journal of Political Economy*.
- Gabaix, X. (2009). “Power laws in economics and finance.” *Annual Review of Economics*.
- Huggett, M. (1993). “The risk-free rate in heterogeneous-agent incomplete insurance economies.” *Journal of Economic Dynamics and Control*
- Klette and S. Kortum (2004). “Innovating firms and aggregate innovation”. *Journal of Political Economy*.
- Lentz, R. and D. Mortensen (2005). ‘Productivity growth and worker reallocation’, *International Economic Review*.
- Lentz, R. and D. Mortensen (2008). “An empirical model of growth through product innovation.” *Econometrica*,
- Luttmer, E.G. (2007) “Selection, growth, and the size distribution of firms.” *The Quarterly Journal of Economics*. :6): 953-969.
- Perla, J. and C. Tonetti (2014). “Equilibrium imitation and growth.” *Journal of Political Economy*.
- Piketty and Zucman (2014) “Wealth and inheritance in the long run.” *Handbook of Income Distribution*.
- Skiba, A. K. (1978) “Optimal growth with a convex-concave production function.” *Econometrica*.