

Macroeconomics  
411-1  
Fall, 2007  
Christiano

## Syllabus

### 1. General Information.

- Apart from three exceptions, lectures are MW, 9-10:50am, economics department lecture room. Discussion section: Friday 9 - 10.50am, economics department lecture room. Three exceptions: The October 17, November 5 and November 26 lectures will be presented during recitation on October 26, November 2 and November 16, respectively. The October 17, November 5 and November 26 lecture times will be taken by recitation.
- My office number is 3246, Andersen Hall; Phone: 491-8231. Email: l-christiano@northwestern.edu. Office hours: Wednesday, 2 - 3pm.
- Teaching Assistant: Nic Lehmann-Ziebarth, telephone number, 491-8211; room 346; office hours, Thursday 2-4pm; email, n-lehmann-ziebarth@northwestern.edu.
- The grades will be determined as follows: homeworks, 10%; midterm, 40%; final, 50%. There will be weekly homework assignments. You are requested to work in teams of up to five students on these problem sets, and only one should be submitted per group. Homeworks should be turned in to the Economics Department office by Wednesday, 5pm, in the week after they are assigned.
- The midterm is on Monday, October 15, in the lecture room. The final is on Tuesday, December 11, 9-11am, in the regular lecture room.

### 2. Goals.

Macroeconomics is about: (i) developing positive models that can help us understand the dynamics of key macroeconomic variables: employment, unemployment, interest rates, output, etc.; and (ii) using these

models to make judgements about what policies the government should, or should not, pursue. Classic questions include the proper setting of taxes and money over the business cycle. The purpose of the course is to study basic tools useful for (i) and (ii), and to review (a subset of) the relevant substantive findings reported in the literature.

To address (i), we will begin by developing the basic building block of modern macroeconomics: the infinite lived, deterministic, homogeneous agent growth model. One set of variations of this model will allow us to review a subset of the modern theory of growth. Another will allow us to review basic results in monetary economics. A third set of variations will allow us to review the theory of business cycles.

To address (ii), we will study the optimal determination of tax rates. We will first study this problem assuming the government can determine at some initial date what the optimal setting of these variables is for all time, and all possible circumstances, and that it can then commit itself credibly to actually implementing these policies. We will go on to study the more realistic (though more complicated, too) case where the government lacks the ability to commit.

- The textbooks for the course are S-L and L-S:

Nancy L. Stokey and Robert E. Lucas, Jr., with Edward C. Prescott, *Recursive Methods in Economic Dynamics*, Harvard University Press, 1989.

Ljungqvist and Sargent's, *Recursive Macroeconomic Theory*, 2nd Edition, MIT Press, 2004.

- Additional reading materials will be made available on the course website.

## COURSE OUTLINE

There will be 19 lectures (one of these is taken by the midterm). The topics are summarized below, with the rough number of lectures expected to be devoted to each given in parentheses. The primary and related readings for each lecture are listed. (Many of the related readings may be found on the course website, which can be found by going to my web page.)

1. Infinite Horizon Model With No Uncertainty and Fixed Labor.
  - (a) (four lectures) Efficient Allocations.
    - i. Sequence Approach (S-L: pp. 8-13, sec. 4.5).
    - ii. Function Space and Dynamic Programming (S-L; pp. 13-16, sec. 4.2, sec. 6.1).
  - (b) (one lecture) Equilibrium Concepts (S-L: sec. 2.3; L-S: chap. 6, 7; Cooley-Prescott, 1995, pp. 8-10).
    - i. Sequence concepts:
      - A. Date 0 Arrow-Debreu.
      - B. Sequence-of-Markets.
    - ii. Recursive Competitive Equilibrium.
  - (c) (one lecture) Application of Recursive Methods: Participation Constraints (class handout, Kehoe and Perri, Alvarez and Jermann (2000, 2001), Bodenstein (2005), Kehoe and Levin (1993), Kehoe and Perri (1992), Kocherlakota (1996), Lochner and Monge (2002), Marcet and Marimon (1992, 1999), Ljungqvist and Sargent (2004, chapter 20)).
  - (d) (seven lectures) Application: Growth Theory (L-S, chap11; Jones and Manuelli, 1997).
    - i. Exogenous growth models.
      - A. Growth generated by ‘disembodied’ technical change (S-L, sec. 5.4; related paper: Christiano (1989)).

- B. Growth generated by investment-specific technical change (Greenwood, Hercowitz and Krusell, 1997, Hornstein and Krusell, 1996).
  - ii. Endogenous growth models.
    - A. “Ak” models (Christiano and Harrison (1999, Appendix); see also: Rebelo (1991)).
    - B. Learning-by-doing and learning-or-doing (S-L; sec. 5.7).
    - C. Increasing variety and specialization (Romer, 1987; Matsuyama, 1999; class notes on Matsuyama).
  - iii. Reasons that Growth Might Not Happen, Even if the Technology is ‘Right’
    - A. Overlapping-generations example (Jones and Manuelli, 1997).
    - B. Vested Interests (Herrendorf and Teixeira, (2003), Parente and Prescott (1994, 1999), Krusell and Rios-Rull (1996)).
- 2. (two lectures) Adding Variable Labor and Money. (See: Albanesi, Chari, and Christiano, (2002a); Christiano and Rostagno, (2002); see also Cole and Kocherlakota, 1998).
  - (a) Necessary and Sufficient Conditions for Private Sector Equilibrium In Cash in Advance Economies.
  - (b) Multiplicity of Private Sector Equilibria.
  - (c) The Optimal Private Sector Equilibrium, and the Type of Monetary Policies that Can Support it.
- 3. (two lectures) Adding Uncertainty and Variable Labor: the Real Business Cycle (RBC) Model.
  - (a) Business Cycle Implications (Cooley and Prescott (1995); see also: Prescott (1986), Summers (1986), Boldrin, Christiano and Fisher (2001)).
  - (b) RBC model with multiple equilibria and sunspot equilibria (see: Christiano and Harrison (1999), Shleifer (1983), class notes on Shleifer; related readings: Bryant (1981,1983), Cass and Shell (1983); Cooper and John (1988); Diamond and Dybvig (1983);

Diamond (1982); Farmer (1993); Farmer and Guo (1994,1995); Farmer and Woodford (1984); Gali (1994a,b); Krugman (1991); Woodford (1986,1991)).

4. (two lectures) Optimal Policy

- (a) The case of full commitment, (Chari (1988); see also Chari, Christiano and Kehoe (1994); Lucas and Stokey (1983)).
- (b) The case of no commitment (the ‘time inconsistency problem’) (Chari (1988) and Christiano and Fitzgerald (2002); see also: Chari, Christiano and Eichenbaum (1996); Albanesi, Chari, and Christiano, (2002a,b), Chari and Kehoe (1980); Kydland and Prescott (1977); Stokey (1991)).

## References

- [1] Alvarez, Fernando and Urban Jermann, 2000, 'Efficiency, Equilibrium, and Asset Pricing with Risk of Default,' *Econometrica*, vol. 68, pp. 775-797.
- [2] Alvarez, Fernando and Urban Jermann, 2001, 'Quantitative Asset Pricing Implications of Endogenous Solvency Constraints,' *Review of Financial Studies*, vol. 14, pp. 1117-1151.
- [3] Albanesi, Stefania, V.V. Chari and Lawrence J. Christiano, 2002a, 'How Severe is the Time Consistency Problem in Monetary Policy?,' forthcoming in *Advances in Economic Theory and Econometrics*, edited by Lars Hansen and Stephen Turnovsky.
- [4] Albanesi, Stefania, V.V. Chari and Lawrence J. Christiano, 2002b, 'Expectation Traps and Monetary Policy,' NBER Working Paper 8912.
- [5] Azariadis, Costas, 1981, 'Self-Fulfilling Prophecies,' *Journal of Economic Theory*, 25, pp. 380-396.
- [6] Bodenstein, Martin, 2005, 'International Asset Markets and Real Exchange Rate Volatility,' mimeo, Northwestern University.
- [7] Benhabib, Jess, and Roger E. A. Farmer, 1994, 'Indeterminacy and Growth,' *Journal of Economic Theory* 63, pp. 19-41.
- [8] Benhabib, Jess, and Roger E. A. Farmer, 1995, 'Indeterminacy and Sector-Specific Externalities,' manuscript, department of economics, UCLA, May.
- [9] Benhabib, Jess, and Roberto Perli, 1994, 'Uniqueness and Indeterminacy: On the Dynamics of Endogenous Growth,' *Journal of Economic Theory*, 63, pp. 113-142.
- [10] Boldrin, Michele, L. J. Christiano, and Jonas Fisher, 2001, 'Asset Pricing Lessons for Modeling Business Cycles,' *American Economic Review*.
- [11] Bryant, John, 1981, 'Bank Collapse and Depression,' *Journal of Money, Credit and Banking*, XIII, pp. 454-464.

- [12] Bryant, John, 1983, 'A Simple Rational Expectations Keynes-Type Model,' *Quarterly Journal of Economics*, Vol. XCVIII, no. 3.
- [13] Cass, David, and Karl Shell, 1983, 'Do Sunspots Matter?', *Journal of Political Economy* 91, 193-227.
- [14] Chari, V.V., 1988, 'Time Consistency and Optimal Policy Design,' Federal Reserve Bank of Minneapolis *Quarterly Review*, Fall.
- [15] Chari, V.V., and Patrick J. Kehoe, 1990, 'Sustainable Plans,' *Journal of Political Economy*, vol. 98, no. 4, pp. 783-802.
- [16] Chari, V.V., Lawrence J. Christiano, and Martin Eichenbaum, 1998, 'Expectation Traps and Discretion,' *Journal of Economic Theory*.
- [17] Chari, V.V., Lawrence J. Christiano and Patrick Kehoe, 1994, 'Policy Analysis in Business Cycle Models,' in Thomas F. Cooley, editor, *Frontiers of Business Cycle Research*, Princeton University Press.
- [18] Christiano, Lawrence J., 1989, 'Understanding Japan's Saving Rate: The Reconstruction Hypothesis,' Federal Reserve Bank of Minneapolis *Quarterly Review*, Spring.
- [19] Christiano, Lawrence J., and Terry Fitzgerald, 2002, 'Inflation', manuscript.
- [20] Christiano, Lawrence J., and Sharon Harrison, 1999, 'Chaos, Sunspots and Automatic Stabilizers,' *Journal of Monetary Economics*.
- [21] Cole, Hal and Narayana Kocherlakota, 1998, 'Zero Nominal Interest Rates: Why they are Good and How to Get Them,' Federal Reserve Bank of Minneapolis, *Quarterly Review*, vol. 22, no. 2, pp. 2-10.
- [22] Cooley, Thomas F. and Edward C. Prescott, 1995, 'Economic Growth and Business Cycles,' in Thomas F. Cooley, editor, *Frontiers of Business Cycle Research*, Princeton University Press.
- [23] Cooper, Russell, and Andrew John, 1988, 'Coordinating Coordination Failures in Keynesian Models,' *Quarterly Journal of Economics*, 103, August, pp. 441-463.

- [24] Diamond, Douglas, and Philip Dybvig, 1983, 'Bank Runs, Deposit Insurance, and Liquidity,' *Journal of Political Economy* 91, 3, pp. 401-419.
- [25] Diamond, Peter, 1982, 'Aggregate-Demand Management in Search Equilibrium,' *Journal of Political Economy*, 90, no. 5, pp. 881-894.
- [26] Farmer, Roger E. A., 1993, *The Macroeconomics of Self-Fulfilling Prophecies*, MIT Press.
- [27] Farmer, Roger E. A., and Guo, J.-T., 1994, 'Real Business Cycles and the Animal Spirits Hypothesis,' *Journal of Economic Theory* 63, pp. 42-73.
- [28] Farmer, Roger E. A., and Guo, J.-T., 1995, 'The Econometrics of Indeterminacy: an Applied Study,' *Journal of Monetary Economics*, forthcoming.
- [29] Farmer, Roger E. A., and Michael Woodford, 1984, 'Self-Fulfilling Prophecies and the Business Cycle,' Center for Analytic Research in Economics and Social Science, Working Paper no. 84-12, University of Pennsylvania, April.
- [30] Gali, Jordi, 1994a, 'Monopolistic Competition, Business Cycles, and the Composition of Aggregate Demand,' *Journal of Economic Theory* 63, pp. 73-96.
- [31] Gali, Jordi, 1994b, 'Monopolistic Competition, Endogenous Markups and Growth,' *European Economic Review* 38, pp. 748-756.
- [32] Heaton, John, and Debbie Lucas, 1996, 'Evaluating the Effects of Incomplete Markets on Risk-Sharing and Asset Pricing,' *Journal of Political Economy* 104, pp. 443-487.
- [33] Herrendorf, Berthold and Arilton Teixeira, 2003, 'Monopoly Rights Can Reduce Income Big Time,' manuscript.
- [34] Hornstein, Andreas and Per Krusell, 1996, 'Can Technology Improvements Cause Productivity Slowdowns?', *Macroeconomics Annual*.
- [35] Jones, Larry, and Rodolfo Manuelli, 1997, 'The Sources of Growth', *Journal of Economic Dynamics and Control*, vol. 21, no. 1.

- [36] Kehoe, Timothy, and David Levine, 1993, 'Debt Constrained Asset Markets,' *Review of Economic Studies* vol. 60, pp. 865-888.
- [37] Kehoe, Patrick, and Fabrizio Perri, 2002, International Business Cycles with Endogenous Incomplete Markets, *Econometrica* vol. 70, pp. 907-928.
- [38] Kocherlakota, Narayana, 1996, Implications of Efficient Risk Sharing Without Commitment, *Review of Economic Studies*, vol. 63, pp. 595-609.
- [39] Krusell, Per, and Jose-Victor Rios-Rull, Vested Interests in a Positive Theory of Stagnation and Growth, *The Review of Economic Studies*, vol. 63, no. 2, 301-329.
- [40] Greenwood, Jeremy, Zvi Hercowitz and Per Krusell, 1997, 'Long-Run Implications of Investment-Specific Technological Change,' working paper, Rochester Center for Economic Research, *American Economic Review*.
- [41] Kiyotaki, Nobuhiro, and Randall Wright, 1993, 'A Search-Theoretic Approach to Monetary Economics,' *American Economic Review*, 83, March, pp. 63-77.
- [42] Krugman, Paul, 1991, 'History Versus Expectations,' *Quarterly Journal of Economics*, vol. CVI, no. 2, pp. 651-667.
- [43] Kydland, Finn, and Edward C. Prescott, 1977, 'Rules Rather than Discretion: The Inconsistency of Optimal Plans,' *Journal of Political Economy*, vol. 85, pp. 473-491.
- [44] Lochner, Lance, and Alexander Monge-Naranjo, 2002, 'Human Capital Formation and Endogenous Credit Constraints,' unpublished manuscript, Northwestern University.
- [45] Ljungqvist, Lars, and Thomas Sargent, 2004, *Recursive Macroeconomic Theory*, 2<sup>nd</sup> edition, MIT Press.
- [46] Lucas, Robert E., Jr., and Nancy L. Stokey, 1983, 'Optimal Fiscal and Monetary Policy in an Economy Without Capital,' *Journal of Monetary Economics*, vol. 12, pp. 55-93.

- [47] Marcet, Albert and Ramon Marimon, 1992, ‘Communication, Commitment and Growth,’ *Journal of Economic Theory* 58, no. 2, pp. 219-249.
- [48] Marcet, Albert and Ramon Marimon, 1999, ‘Recursive Contracts,’ mimeo, University of Pompeu Fabra.
- [49] Matsuyama, Kiminori, 1999, ‘Growing Through Cycles,’ *Econometrica*.
- [50] Parente, Stephen L., and Edward C. Prescott, 1994, Barriers to Technology Adoption and Development, *The Journal of Political Economy*, vol. 102, Issue 2, 298-321.
- [51] Parente, Stephen L., and Edward C. Prescott, 1999, Monopoly Rights: A Barrier to Riches, *The American Economic Review*, vol. 89, no. 5.
- [52] Prescott, Edward, 1986, ‘Theory Ahead of Business Cycle Measurement,’ Carnegie-Rochester Conference on Public Policy 24:11-44, Reprinted in Federal Reserve Bank of Minneapolis *Quarterly Review* 10:9-22.
- [53] Rebelo, Sergio, 1991, ‘Long-Run Policy Analysis and Long-Run Growth,’ *Journal of Political Economy*, 99, 3, June, 500-521.
- [54] Romer, David, 1996, *Advanced Macroeconomics*, McGraw-Hill.
- [55] Romer, Paul, 1987, ‘Growth Based on Increasing Returns Due to Specialization,’ *American Economic Review*, 77, 2, (May), 56-62.
- [56] Romer, Paul, 1989, ‘Capital Accumulation in the Theory of Long-Run Growth,’ in Robert Barro, ed. *Modern Business Cycle Theory*, Harvard University Press.
- [57] Shleifer, A., 1986, Implementation cycles, *Journal of Political Economy* 94, 1163–1190.
- [58] Stokey, Nancy, 1991, ‘Credible Public Policy,’ *Journal of Economic Dynamics and Control*, vol. 15, pp. 627-656.
- [59] Summers, Lawrence, 1986, ‘Some Skeptical Observations on Real Business Cycle Theory,’ Federal Reserve Bank of Minneapolis *Quarterly Review*.

- [60] Woodford, Michael, 1986, 'Stationary Sunspot Equilibria in a Finance Constrained Economy,' *Journal of Economic Theory*, vol. 40, no. 1, October.
- [61] Woodford, Michael, 1991, 'Self-Fulfilling Expectations and Fluctuations in Aggregate Demand,' in N. Gregory Mankiw and David Romer, editors, *New Keynesian Economics, vol. 2, Coordination Failures and Real Rigidities*, MIT Press.